

**Role of Forestry Extension in promoting afforestation in
Khartoum State**

By

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Dedication

To my parents

To my only one brother

To my sisters

To my fiancé

To my family

To A. Susan Abed Allah Ali

To my all friends

Acknowledgements

Many of people, and not all of them can be listed here, have helped in this work. It would be a vain effort to evaluate and list these contributions. Credit of success is to them all. I would like to express my gratitude to my supervisor, Dr. Amin Sanjak Mohamed for his support and valuable Follow up. My thanks to FNC staff especially my colleagues for their help and hospitality during data collection. My thanks to Dr. Mohammed Ali Al Hadi for his provision of essential comments, tools and copies of previous studies conducted in Sudan. My thanks to the nice people of Tayba Elhasanab Butri and El gadeed El thora for their cooperation and patience to respond to my questionnaire and group discussion. I am grateful to all my friends and colleagues, who contributed to this work in Soba which include; FNC staff, staff of Forests Research Center and University of Sudan Faculty of Forestry Science and Range.

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Abstract

Role of Forestry Extension in promoting afforestation in Khartoum State

The broad objective of this study was to evaluate the extension services introduced by Soba central nursery (Khartoum state) in terms of adoption of tree planting and sustainability of plantation program. Two types of data were used in this research, primary and secondary data. The primary data were collected using two methods of social surveys (interviews and group discussions), while the secondary data were collected from the files, documents and archives of the Forests National Corporation (FNC). Were the following:

- i. Land tenure was a determinant factor for the adoption of tree planting in farms.
- ii. Different types of land ownership existed in the study area like title holder, free release, crop-sharing, rent and release to relatives.
- iii. The area of the farm was an important factor for the success of the afforestation programs.
- iv. The level of awareness was high among the interviewed sample where the majority of the respondents were acquainted with the environmental roles of trees.
- v. The main trees used in the afforestation program were; Kafur trees (*Eucalyptus sp.*), Damas (*Conocarpus sp.*), and Dign EL Basha (*Albizia lebbeck*) besides some horticultural trees like lemon, date palm and mango.
- vi. Farmers adopted trees planting at their farms for the sake of having an additional source of income, amelioration of micro-climate, protection of top soil from erosion, and to restore soil fertility.

- vii. The number of seedlings distributed by the central nursery during ten years (1997–2007) showed a dramatic decline in the number of seedlings produced at the nursery. The year 2007 showed the lowest seedlings distribution. The main factor behind this decline was the lack of means for seedlings transportation; the central nursery is under funded and understaffed. Moreover, the extension service was sporadic and confined to farmers close to the central nursery.
- viii. The initial phase of the project witnessed a complete reliance on sophisticated inputs imported from Finland without using any local material.
- ix. After the phase-out of the project, the running cost added a new burden on the budget of the FNC; as a result the activities of the central nursery witnessed intensive modification.
- x. The main risks confronting tree planting at farms as perceived by farmers were; fluctuation of rainfall, frequent drought cycles, lack of fences (overgrazing), and lack of effective and efficient extension service.

In conclusions, to enhance adoption of agro forestry interventions, categorization of land tenure is a pre-requisite for specifying the land ownership that guarantees the success of the afforestation program. The level of awareness is high; necessitating a continuous dissemination of information using different extension methods and communication channels. All the factors of success of the afforestation program are available, i.e., fertile soils and source of irrigation (Blue Nile). An effective extension unit is needed to sensitize and mobilize farmers to participate in the afforestation program.

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CHAPTER I

INTRODUCTION

1.1 Background

Sudan is the largest country in Africa with total area of 2.5 million square kilometers. The total population of the Sudan was estimated in 1993 to be 24.9 millions, 66% of which constituted the rural sector. This large rural component is heavily dependent on land since the economy of the country is predominantly agricultural. The agricultural sector accounts for about 40% of the Gross National Products (GNP) and its principal exports are cotton, oil seeds and gum Arabic (Badi, 1988). The annual precipitation in Sudan is highly variable. The distribution of the forests and forest types follows the isohyets and soil types (FINNIDA, 1986). The forestry sector constitutes an appreciable size in Sudan economy. It accounts to some 12% of GNP. However the Forests National Corporation (FNC) estimates this contribution to be more than 20% (FNC, 2002). The fuel wood and charcoal are the main products of Sudan forests. In 1994 they account for 80% of the energy consumed by the different households (FAO, 1994).

The whole world is now concerned about the terrifying speed with which forest resources are diminishing. Private forestry is a reasonable alternative for the prevention of this decline. The root causes of forest depletion are outside the forest sector itself: these causes are social, demographic and economic and countering them requires institutional and policy changes. The ultimate success of any reforestation strategy depends on the social forest that can be summoned to accomplish the task. Such forestry strategies are called forth not simply to pursue conservation of remaining forests, but also to trigger of massive additional tree planting both inside and outside forest. Thus reforestation provides a convincing illustration of the proposition that the resolution of the environmental problems of

development is to be searched for in the realm of the social organization (Chamber, 1982).

Forest resources in the Sudan witnessed severe degradation, in 1958 the forest cover constituted 35% of Sudan total area, this was reduced to 25.6 % in 2000 (Forest Resources Assessment, 2000). Although some of this damage was attributed to several factors such as repeated drought, uncontrolled activities of deforestation through land clearing for mechanized agriculture, over grazing, and bush burning, fuel wood and charcoal production is still one of the major factor causing reduction in Sudan forest area. Increased human and animal populations have also aggravated the problem (FAO, 2000). The massive removal of forests cover has resulted in disaster consequences among which are the process of deforestation, desertification and desert encroachment.

Khartoum State lies in latitude 16⁰ N and so the whole area is in the semi-arid zone. The average growth/year of the forest can hardly reach the values of 0.1 – 0.2 m³/ha. In Khartoum State it is difficult to find such a wooded, shrubby spot where wood could be got without the grave danger of degradation. Several non-Governmental Organizations (NGOs) worked in the country and some of them worked at Khartoum State. Finish International Development Agency (FINNIDA) contributed to mitigation of deforestation trend in the country as whole. At Khartoum State, the organization established a central nursery to serve the state and the surrounding localities adjacent to Khartoum State. Due to the existence of the central nursery, Khartoum State Forests produce annually about (300.000-350.000) seedlings per year in Soba Nursery Center, and the annually distribution of these seedlings is about (200.000-250.000) seedlings per year with different kinds of seedling of forest trees specially *Eucalyptus kamaldulensis* which represent over 90% of Soba Central Nursery production because it was planned to use the species for establishment of windbreaks and shelterbelts in

farms. Moreover, the activity of the central nursery includes; schools and public areas like mosques, hospitals, households, administrations and the main roads.

1.2. Scope of the study

Projects in the forest sector have linkages to a wide range of economic activities. Two key points about the many different outputs of forest projects are: many of the outputs that forests and trees produce are produced by natural forests whether or not foresters practice silviculture, so long as the forest is protected; and many of the outputs do not enter the market place and thus do not have market prices or monetary values associated with them. Forest sector projects usually involve situations in which the forestry activities also influence broader measures of development, such as employment and environmental values.

The principal linkages of forestry projects with the rural sector are through the contributions made by forest based products, services and activities to the livelihood systems of rural people. In addition, control and management of tree and forest resources can affect the strength of social structures and local institutions (FAO, 1993). The long-term objectives of forestry development in the Sudan are to improve the living conditions of the population by making the necessities of household forest products really available, protect the arable lands from winds and sand dunes and improve the natural water balance of the soil by tree planting activities. As a result the country has been a focus for development projects among which is the Finland support to the forestry sector in the Sudan since 1979.

The Sudan- Finland program covers several areas of interventions. The support programs included afforestation and reforestation in irrigated and non irrigated areas in some states of the country, besides the support program which was extended to institutional support to Central Forest Administration, forestry

technicians of Sudan University and Forests Research Center. The main objectives of the project as stated in the project documents are to alleviate the problem of natural resource degradation. Accordingly a considerable amount of funding had been invested to execute these afforestation programs. Among the different activities made by Sudan -Finland program are Khartoum green Belt and afforestation of farm lands in Khartoum State which is the focus of this study

1.3. Problem statement

Considerable efforts are exerted by the FNC represented in its central nurseries (Soba and AL Mugran) to meet the objective of afforestation program. Annually, these nurseries produce big number of seedlings for saking of greening the capital and to encourage adoption of agroforestry at the state. Moreover, afforestation programs formulated to address government institutions, particularly schools, and Islamic institutions (mosques and khalawa). These efforts are not accompanied with intensive extension programs to sensitize local people to adopt tree planting and to disseminate information regarding selection of trees for different purposes. Furthermore, despite the huge number of seedlings distributed to farmers in Khartoum and Gezira states, no study was made to assess the success of the afforestation program and attainment of sustainable development. Therefore, this study attempts to investigate the role of the afforestation program in sustainable development in the study area Soba Central Nursery was selected.

1.4 Objectives

The broad objective of this study is to assess the extension services introduced by Soba Central Nursery in terms of adoption of tree planting and sustainability of interventions, more specifically the objectives are:

- To explore the types of extension services provided to farmers to adopt tree planting in farms.
- To highlight extension methods used to sensitize and mobilize farmers to participate in the project activities.

- To investigate the afforestation trend in the study area.
- To determine measures of risks and constraints confronting the afforestation programs in the study area.

1.5. Research questions

To tackle the problem of the research, some leading questions were formulated to cover the main topic. The main questions are:

- What are the extension services introduced to farmers to enhance their participation in the afforestation program?
- What are the extension methods used by the extensionists to guarantee the participation of farmers?
- What is the trend of seedlings distribution and adoption in the study area?
- What are the measures of risks and constraints confronting the afforestation program in the study area?

CHAPTER II

LITERATURE REVIEW

2.1. Agricultural extension

There is no single definition of extension which is universally accepted or which applicable to all situations. Furthermore, extension is a dynamic concept in the sense that the interpretation of it is always changing. Extension, therefore, is not a term which can be precisely defined, but one which describes a continual and changing process in rural areas. Generally, extension is an informal educational process directed toward the rural population. This process offers advice and information to help them solve their problems (FAO, 1985). Extension is a process of working with rural people in order to improve their livelihoods. This involves helping farmers to improve the productivity of their agriculture and also developing their abilities to direct their own future development. All stress that extension is a process which occurs over a period of time, and not a single, one-time activity. Also all underline extension as an educational process which works with rural people, supports them and prepares them to confront their problems more successfully (FAO, 1984). Extension is an on going process of getting useful information to people (the communication dimension) and then in assisting those people to acquire the necessary, skills and attitude to utilize effectively this information or technology (The education dimension) (FAO, 1985).

Agricultural extension is a difficult term to define precisely because it is organized in different ways to accomplish a wide variety of objectives. The term has a variety of meanings to different people, but from this spectrum of different interpretation, this appears to be several common features (FAO, 1980). Extension is any activity that works with farmers and their life and to develop their ability to take responsibility for their own future development (FAO, 1984).

The extension function can be used equally well by both the private and public sectors, although most general agricultural extension organizations are public sectors institutions, it can be combined or integrated with other technology transfer functions, as it the case in most commodity development programs. However, most agricultural extension organizations are to concentrate on the education function (FAO, 1984). Extension or non-formal education as it sometimes called can be used effectively in non agricultural program area, such as rural health, family planning or community development. In other words, extension can be successfully used by different types of organizations or by different groups of people with different messages. The term agricultural extension narrows the focus and defines the area to which the extension process is applied. Agricultural extension as a service or a system which assist farm people, through educational procedures, in improving farming methods and techniques, increasing production efficiency and income ,bettering their level of living, and lifting the social and educational standards of rural life’’ (FAO, 1984).

2.1.1 Forestry extension

In broad sense extension is an education process that informs, convinces and links people. It facilitates flows of information between farmers and other resource users, administration managers and leaders (Ageed, 2002). The term forestry extension is used to cover any situation in which local people are directly and willingly involved in forestry activities from which they will expect some recognizable benefits within reasonable period of time .Where necessary this may include activities by industries or public organizations other than the forestry authority to promote forestry by individuals or by groups of people within limited area. It presupposes, however, that the participation arises from some perceived needs or opportunities which the people have recognized as being sufficiently important to devote part of

their time, energy and resources to accomplish (FAO, 1987). Extension should be regarded as a process of integrating indigenous and derived knowledge, attitudes and skills to determine what is needed, how it can be done, what local co-operation and resources can be mobilized and what additional assistance is available and may be necessary to overcome particular obstacles (FAO, 1987).

The term ‘‘ forestry extension ‘‘ is used to cover any situation where people are directly involved in any forestry activity on their own land, or on land owned or controlled by the community or state, in which the people have a direct interest in the outcome, and from which they hope to derive some return in goods, cash, or other benefits, within a reasonable period of time . Where appropriate, this may include program undertaken by non-government organizations or industries to promote forestry by individuals or groups of people, to meet either community or industrial needs in the area. The contents may, therefore, be adapted to cover activities referred to as social forestry, community forestry or by other similar terms, if these are considered to describe more accurately what is being practiced in a particular area (FAO, 1984).

2.2. Objectives of forestry extension

Generally the goal of the extension process is to enable people to use the skills, knowledge, and information to improve their quality of life . The extension function can be used equally well by the private and public sector, although most general agricultural extension organizations are public sector institutions. The purpose of extension is to facilitate learning and action among the numbers of farm families and communities, extension educators and administrators, and personnel of other services agencies and groups in

order to promote agricultural production and improvements in the general quality in rural life (FAO, 1984).

Agricultural extension works to promote desired changes in geographical area overtime. It usually assumes a systematic nature to planning by objectives , specifying targeted client groups, delineating an interrelated set of roles and professional specializations, utilizing and methods to promote learning, identifying and mobilizing available resources, and a continuous upgrading of the competencies of extension personnel (FAO, 1984).

The main purpose of forestry extension is to help people to examine problems which are affecting their lives and to consider if they may be solved , or at least alleviated , by using forestry techniques within the range of their skills and financial resources. the views of the people should, in turn , be relayed to the officials who frame the laws and design the infrastructure of the region so that may promote policies which facilitate the achievement of the peoples objectives .The emphasis must be on local people recognizing a need and deciding to do some thing about it , and definition of such a need and to indicate a variety of possible courses of action from which the local people can select the one most suited to their particular situation . The fundamental aim is not to provide an organization to do things for the people, however desirable these things may be, but to assist people to do things for themselves, to develop a genuinely critical view of their own situation and a realistic assessment of their ability to taking the necessary any defects . From initial success in solving one limited problem, people may go on to tackle more complex problems, and build up the experience and judgment necessary to improve a whole range of activities to enhance the quality of their lives (FAO, 1987).

Once the existing situation has been analyzed, decisions can be made about the changes that should be brought about through an extension program. The key questions are how will local problems be solved and how will local potential be developed.

In looking for solutions to local problems, the agent should distinguish between technical solutions, involving improved inputs or simple changes in husbandry practice, and solution which involve institutional changes, such as improved credit and marketing systems. Solutions involving institutional changes may require action by other agencies and at higher levels. The sources of ideas for developing an areas potential include (FAO, 1985; Gerber *et. al.*, 2006):

- The agent own technical knowledge;
- Farmers and agents from other areas who have tackled similar problems successfully;
- Applied research tasted new ideas under farm conditions;
- National priorities and directives;
- Projects which makes funds available for particular activities.

When selecting from among the range of solutions and possible improvements, agent and farmers should ensure that proposed solutions are:

- Acceptable to farmers in the area
- Technically sound and tested by research and experience elsewhere.
- Consistent with national policy, and with the local activities of other agencies.
- Feasible within time and with the resources available to farmers and the extension service.

The agent may find that some problems will have no feasible or acceptable solution that can be implemented locally within period of the extension program. The agent should lessen the effect of such problems where possible and act as a

channel for putting forward the case of changes to those who have the power to make them (FAO, 1985). The extension agent should give consideration to time and available resources which could be limited for sake of stating the objectives of the extension program emphasizing on the objectives that have a higher priority than others. Wherever possible, objectives should be expressed in terms of amounts and numbers, rather than general statement (Richards, 1990).

The objectives for an annual extension program will state what should have been achieved by the end of the program. These statements can be broken down into intermediate steps to be taken during the year in order to achieve the program objectives. Again, the agent will have to make choices, selecting the most appropriate steps from several possibilities. As the agent breaks down each program objective into specific steps, he will in preparing a schedule of extension activities for the program period. He will decide what knowledge and skills the farmers will need; what additional technical information will be required from the specialists and research workers; what extension methods will be used; and what resources and support he will need from his own and other agencies (Adams, 2001). Moreover, the agent can compile the entire plan into an overall annual work plan by dropping the lower priority objectives. The annual work plan does not specify what the agent will be doing on each day during the year, but it should indicate when each extension activity will be and end, and what resources will be needed for each (FAO, 1985).

2.3. Methods of forestry extension

The basic philosophy of forestry extension is to work with people, develop self-reliance, and establishing a local organization to promote development, definition of local problems and barriers to their solution, review of possible solution to identify problems, sources of information and support; selection of appropriate solution and definition of steps necessary to implement the program; development of program of activities with defined targets and responsibilities; leadership, sharing burdens and rewards, learning by evaluation (FAO, 1986) . Methods of extension generally fall into three main categories individual method, group

method and mass method. Irrespective of the extension message, the task of Forestry extension staff focuses on: provide people with an opportunity to learn, by methods, and in circumstances, appropriate to them; to stimulate in their clients mental and physical activity which leads to effective learning, and to achieve their objectives, forestry extension methods must meet these two major requirements. People learn in different ways, some by listening, some by observing, and some through discussion. A person will, generally, learn more effectively by using a combination of two or more of these methods. Studies suggest that the more varied the methods of extension used in an area, the more people change their attitudes and practices (Wilson, 2000)

Different extension methods have been found to be more effective in different situations, and at different stages in the adoption process. All people do not learn, or change their practices, at the same speed. Some may be ready to adopt a new practice and need to know how to carry it out, while others are, as yet, scarcely aware that it exists or are just beginning to show an interest in it. For these reasons, the use of a variety of extension methods, suited to the needs of the people, and used either consecutively or in some cases simultaneously, is necessary to carry out an effective forestry extension program (Pennsylvania Farm Bureau, 2006).

2.3.1. Individual contacts

A most effective way of bringing about change is through individual contact in the home or in the work place, or in some cases through informal contact in markets or in public places. This raises problems, however, in selecting suitable persons for such contacts in the limited number of people who can be contacted within a given period and possibility that this may give rise to feelings of neglect or even of jealousy amongst some members of the community who cannot be included in the program (FAO, 1987). In this method the agent deals with

farmers on one-to-one. Individual, face-to-face, contact has been found to be the most effective way of facilitating the learning process in an individual. Personal contacts have many important values such as (Hodgart, 2006):

- The personal influence of an extension agent is important securing co-operation and participation in extension activities and in the adoption of improved practices;
- People will listen to the advice and suggestions of extension staff whom they feel they know and like personally, and whose knowledge they respect; and,
- Immediate feedback is obtained on whether the message has been understood in the sense intended.

These factors pose considerable problems for extension organizations in developing countries. There are usually serious shortages of mature and experienced staff available for extension duties and the organizations have to rely mainly on young urban, recently qualified people who lack a depth of field experience and who find it difficult to establish the trust and mutual respect necessary between the extension staff and their clients. This may be a particularly serious problem in communities where there is more respect for age and wisdom than for formal education (FAO, 1987). Individual or face-to-face methods are probably the most universally used extension methods in both developed and developing countries. The extension agent meets the farmer at home or on the farm and discusses issues of mutual interest, giving to farmer both the information and advice. The atmosphere of the meeting is usually informal and relaxed, and the farmer is able to benefit from the agents individual attention. Individual meetings are probably the most important aspect of all extension work and individual for building confidence between agent and the farmer. A farmer is often likely to listen to the advice given by the extension agent and will be

grateful for this individual attention. This individual contact between the extension agent and the farmer can take a number of forms (FAO, 1984):

2.3.1.1. Farm and home visit

The farm and home visit involve method meeting individually with farmer or farm worker at the farm or home. This technique is costly in terms of time spent and the number of clients contacted, which will necessarily be few. The extension worker should visit many different farms and homes, and care should be exercised to visit men and women farm managers as well as other members of the farm family (FAO, 1984). A farm and home visit serves a number of purposes (Song and Vernooy, 2003):

- To establish contact with men and women farmers and with others within the farm household.
- To learn what practices and problems exist on the farm and in the house,
- To provide information and assistance.

2.3.1.2. Office calls and inquiries

This method is concerned with personal visits made by clientele to the extension office, to seek information and assistance. To encourage office visits, extension workers should consider the following (FAO, 1984):

- Place the extension office in a convenient location.
- Keep regular office hours so clients will know when the extension worker will be available.
- Keep the office neat, orderly, and attractive.
- Maintain an up-to-date bulletin board and have information materials readily available.
- Make a special effort to put the visitor at ease, especially if the individual appears to be shy in the unfamiliar environment.

- A visit to the extension office is a statement of confidence in the extension worker and his or her advice, and should be handled carefully (FAO, 1984).

2.3.1.3. Informal contacts

Informal contacts are unstructured and/or planned meetings with clientele in an informal setting. Such meetings provide the extension worker with an opportunity to meet clientele in an informal situation, which facilitates the establishment of a personal bond, discussion, and the recommendation of solutions. Informal contacts can take place on the street, in the market place or at local celebrations. These meetings often take place by chance and are casual in nature. An effective extension worker is skilful in utilizing such informal teaching situations (FAO, 1984, and Department of Education and Science, 2009).

2.3.1.4. Personal letters

Personal letters may be of limited importance in extension activities in some area at present, but their importance will increase as literacy become widespread. Letters are the main form of communication both within an extension organization and with other public organizations. All extension staff should try to acquire some skill in letter writing (FAO, 1984).

2.3.1. 5.Telephone calls

Telephone calls are becoming increasingly popular in transacting business in developed societies and, if used properly, they can be very valuable in explaining a situation and obtaining advice or instructions over long distances within a very short time. Staff should be trained to make and to receive telephone calls effectively. It should, however, be emphasis in training that there is no permanent record of what was said during a telephone call and great care must be taken to ensure that all detailed instructions given during one are fully understood (FAO, 1984).

2.3.2. Group contacts

This method is designed to assist specific groups, such as farmers, producers or users of forest produce, women's or youth groups. It is becoming increasingly important as extension procedure (CAMBRIDGE JOURNAL, 1998). Not only information be presented, or techniques demonstrated to several people, usually with a common interest, at one time, but discussions can be offered by the group and group questions from both sides can be asked and answered. This situation makes learning easier and may stimulate group members to take joint action on a problem (FAO, 1987). In this method the agent brings the farmers together in one farm or another in order to undertake his extension work (FAO, 1984). The method consists of a number of activities. They include such important extension activities as community meeting, method and result demonstrations, field days and tours. This process can assist people to reach a decision to take joint action on a problem. It is important to give special considerations in selecting or forming groups to promote extension activities (FAO, 1987).

The extension agent should consider the use of the group approach in his work with farmers. The use of groups in extension has become more common over the past decade, and indeed a number of new ideas have emerged about how groups may be used most effectively (FAO, 1984). Group methods are useful for a number of reasons such as (Diem, 1999):

- To give or receive information about a proposed extension program;
- To help create a favorable attitude towards a program;
- To focus attention on problems jointly affecting members of the group and possible forestry solutions to them;
- To create awareness and interest in a particular forestry practice by describing it carefully and discussing its implications for the local community and possible benefits from it;

- To encourage, advice and train community leaders; and,
- To stimulate basic forestry skills at a convenient location.

The main features of the group methods are (Diem, 1997); Less expensive than individual methods, in terms of staff time and effort, to cover a given number of people; very effective, in that attitudes and decisions arrived at by group discussion usually carry more weight in a community than individual attitudes and discussion and are more likely to be widely adopt; and, they are able to assist the learning or change process of individual by the exchange of ideas and experiences between members of the group. Some of the disadvantages of group methods, however, are (Diem, 1999):

- It may take along period of discussion for a group of people to arrive at decision on a matter;
- One or two people with strongly-held divergent opinions may deflect the group from a wise decision;
- Because of differences in conditions and interests of the group members, instruction in forestry practices cannot always be related to the particular problems of each members; and,
- It is not always easy to get all the members of a group of people together at the same time for discussion or action.

The advantages, however, of group methods out weight their limitations and they play a most important part in extension program. They usually lead to a much more rapid spread of information and change of attitudes than could be achieved by their spread from a few isolated persons enjoying individual contacts with extension staff (FAO, 1987). The group method takes different forms like; group meetings which is a useful educational form where the agent and farmers can come together, and ideas can be openly discussed and analyzed (FAO, 1985); purposes of group meeting which introduce and discuss new ideas or practices, create a favorable attitude towards forestry as a means of local community development.

2.3.3. Mass contacts

As neither individual nor group methods can reach everyone who may want or need information on forestry extension matters, various methods of mass communication such as print, broadcast or audio-visual methods are employed to reach large numbers of people quickly and often at low cost . The information they convey must be, in most cases, generalized but it can play an important role in certain phases of an extension campaign. In this case contact is more tenuous. It is achieved mainly through the various means of mass communication such as printed matter, broadcasts or audio-visual presentations. The lack of direct contact makes it difficult to assess if the message has been properly received and understood by the audience and more difficult to modify to suit any particular groups of people or areas of the country (FAO, 1987).

Mass methods are used for a variety of reasons which include the following:

- They help carry forestry information to many more people in a short period of time;
- They help create general awareness and interest in a new topic or forestry activity;
- They help form favorable attitudes amongst the general public towards forestry extension program; and,
- They provide helpful repetition and reinforcement of extension messages to those already contacted personally through individual or group methods (FAO, 1987).

Some of the positive features of mass media are (Journal of Development Studies, 1984);

- They can increase the impact of extension staff in the field by the rapid spread of information, though they involve no personal contact;
- Many more people can be influenced, over a given period of time, than by individual or group methods; and

- News stories, repeating basically the same information on radio, TV and in press releases help the people to remember the message (FAO, 1987).

Some of the less favorable aspect of mass media which must be taken into account in planning their use are (Oates *et. al.*, 2006):

- Comparatively few people in rural areas in developing countries have access to newspapers regularly;
- The number of television sets in these areas is also limited by national coverage and cost; and,
- The amount of detailed information, on which people can act, can be transmitted by mass media, is limited (FAO, 1987).

Some examples of mass media and the ways which they can be used most effectively include; circular letters, press, radio TV and others

2.4. Development of extension program

In the initial stages, the need for a forestry extension program may not be properly recognized by the people concerned, though it may be recognized by foresters and other staff engaged in land use activities. For a program to succeed, however, it is necessary for the people themselves to recognize the need and to agree that something must be done to meet it. Therefore, needs or opportunities may have to be brought to their attention by some tactful comment and suggestions (FAO, 1986).

2.4.1. Identification of an extension program

There are sequential steps in the process of identification and development of extension program. The process starts with identification of problems associated with forests, forest products to be tackled and address by the extension program. This step is followed by proper selection of the suitable and best mass media to arouse awareness and interest; Follow-up by local staff; meetings, slide, film or video presentations to heighten interest; meetings to define problems and agree

on need for action; selection of a group to define objectives and select course of action; preparation of plan with specific targets, review of resources, operations, with a time of schedule for their implementation; applications for support; approval by community and development authority; execution of plan. Records of achievements; processes of evaluation; evaluation of success (FAO, 1988).

2.4.2. Developing forestry extension program

An essential feature in developing a successful forestry extension program is to determine whether the people concerned feel a genuine need, and are prepared to take some action to meet it. They must also show a willingness to give up their time and energy to achieve their aims (FAO, 1986). In creating a forestry extension program the emphasis must change from patient discussion of possible lines of activity to drawing up a more detailed work plan which should in time be set down as a simple written document (FAO, 1986). The plan should state the following briefly and clearly:

- The goals: - the broad general purposes of the plan;
- The objectives: - a more detailed statement of the steps necessary to achieve the goals in their order of priority;
- The timetable: - an out line statement of when the various tasks should be accomplished in order to achieve the immediate objectives;
- The responsibilities: - a clear statement of who is responsible for planning or executing the various steps to carry out the tasks agreed as necessary;
- The procedure for sharing costs and benefits etc
- Ways of monitoring and evaluating the program, regular assessment and discussion of results achieved to date and lessons to be incorporated in future development plans.

The process of preparing the plan must itself be looked on as learning exercise in trying to anticipate problems and possible solutions, to fix realistic targets in terms of work to be done, transport required and costs (FAO, 1986).

2.4.3. Forestry and rural development

Some relevant factors of rural development include; establish costumes for personal and community attitudes to change. Availability of basis resources of lands, labour, water, markets, etc,; land tenure, traditional, or customary rights of use of passage ;generation of resources to finance improvement; price structure, grants; personal problems of managing loans, consequences of default; marketing of increase produce; acquisition of new skills and work habits; infrastructure developments; transport, education, health, community activity, rural organizations (FAO, 1988).

Contribution of forestry to rural development is exemplified in provision of job opportunities in relation to existing patterns and seasons of work; provision of new skills; contribution of agroforestry systems in terms of shelter, fruit, fodder, fuel wood and timber; improved agricultural practices; effect of savings of time or expense; generation of additional cash resources, value of silvipasture systems in improved herding practices; livestock production; soil/ water relationships (FAO, 1988).

2.4.4. Steps in developing a forestry extension program

Too often in the past extension program in agriculture and related fields have concentrated on supplying what outsiders thought local people needed, with little or no consultation on how the people themselves viewed the matter. People, out of natural politeness, or in some cases a fear of government authority, might go along with the proposal, to a limited extent, but without any sincere commitment to its success or belief that it would be of any real benefit to them (FAO, 1987). An important step in developing forestry extension program is to guide people, tactfully, to adopt an

objective, and form of work, which are realistic in relation to the resources of time, skill and materials they can devote to it. From a generalized objective, a more specific target which can be achieved within a reasonable period of time must be selected. If the people are to have a proper commitment to the objectives, however, they should first be guided to consider what they can contribute in labour or resources to achieve it. At this stage a proper balance of local commitment and possible external assistance must be secured. Extension staff must be properly skeptical about offers of assistance from leaders of a community who may will be ‘volunteering’ the services of their wives or less enthusiastic dependant relatives, without first consulting them (Noe, 2007).

Agreement to co-operate must involve the personal commitment of the individual. In some cases the resources of an area may be so limited that they must be supplemented by rewards in foodstuffs or in cash if people are to be able to undertake any additional work. Defining the nature and correct level of assistance to an extension program requires as much care as the decision taken by the people on the objectives themselves. It involves social and legal questions such as the availability of suitable land, the traditions of individual or communal. Work amongst the people, their knowledge of appropriate forestry techniques and their willingness or ability to learn them (FAO, 1987).

2.5. Evaluation of extension program

Three essential features of forestry extension program are: monitoring, evaluation and feedback. Monitoring has been defined as a continuous or periodic surveillance over the implementation of a project to ensure that input deliveries, work over schedules, targeted outputs and other required actions are proceeding according to plan (IFAD, 1984; FAO, 1988). Monitoring should continue throughout the duration of a project and form an essential management process to measure and adjust performance against planned activity (FAO, 1988). While evaluation, is a systematic approach to assess relevance, effectiveness and impact of a project in the context of the project activities and the needs of the people (FAO, 1988). Evaluation is an activity we engage in every day because we are

always making judgments relating to the value or worth of things we do experience (FAO, 1984).

2.5.1. Definition of evaluation

Extension evaluation can be defined as continuous and systematic process of assessing the value or potential value of extension programs. This process includes developing criteria from the concerns of the relevant audiences for the evaluation, the collection of data relating to the criteria, and the provision of information that adequately address the concerns. Extension evaluations conducted regularly during program implementation will include the potential value of program. The major purpose of evaluations is to assist in program decisions. Formal evaluations are worth doing only if they have a chance of affecting such decisions (Bennett, 1973; FAO, 1984). Extension programs are evaluated to (Castillo and Cano, 2004):

- Ascertain for the extension organization how will agent perform, that they suitability for promotion may be assessed;
- Satisfy the government that public money spent on extension is being used effectively; and
- Permit the agent to learn from what has happened.

Evaluation is a waste of time unless the results have an influence on future extension decisions (FAO, 1985). One approach to evaluation is to ask if the programs objectives were achieved. This is an important first step and one which is made easier if the program had clear, precise objectives. If the answer is no, then there is no real basis on which to make improvements in future programs. It is important, therefore, to ask why things turned out in the way they did. Only when that question is answered can the agent learn from the past (FAO, 1985).

2.5.2. Levels of evaluation

There are several levels of evaluation to extension programs. At the most general level, the effect of extension on agricultural production, family income and standards of living can be evaluated. An increase in family living standards is usually an important ultimate

goal of rural extension and it is, therefore, important to ask whether any increase has occurred (AgrAbility Brochure, 1999). Evaluation of this kind involves measuring production and farm income for representative sample of farm families, and then comparing the figures and then related to the extension inputs and activities during the program (FAO, 1984). Evaluation often provokes negative reaction when suggested to director of program, project managers and field staff. It is sometimes thought that evaluation brings out only what is believed to be wrong with a program; the successes are perhaps noted, but they seem to receive little attention. There are common, and often, unfortunately, justified views on evaluation, monitoring and control activities in many bureaucracies (FAO, 1986).

Feed back, which is an important element in an evaluation of forestry extension program, can be defined as applying promptly and effectively information gathered by the monitoring or evaluation processes to promote the achievement of the project objectives, or to rectify factors impeding its achievement (FAO, 1988). It has been suggested that the purpose of evaluation is to keep people honest about what they are doing. It is easy to get emotionally committed to a program and fail to realize that mistakes have been, or have being made. It is necessary to be honest about both failures and successes.

There are often several ways of doing a particular thing, and a key purpose of evaluation is to ensure, as far as practicable, that the best way of achieving the goal, in the circumstances, has been chosen. If the goal of a forestry program is simply to get trees planted, this can easily be done by hiring Local people, giving them some brief training, and getting the planting done a good evaluation strategy requires that a number of steps are specified which will give some indication of how well the program is progressing at the moment, and at agreed intervals where after (FAO, 1986).

2.6. Training of extension program

Training forms a major element in the establishment and implementation of a forestry extension program. Training, may, for convenience, be considered under two main headings: formal staff education and training in extension; and, informal extension information and training programs. There must, however, be close co-ordination between all forms and levels of training to ensure that they serve common objectives and seek to reach these by compatible means (FAO, 1987).

2.6.1. Pre-requisites for training of extension program

Before resources are committed to training, a clear need for training program must be established. Two questions must be asked: who is to be trained; and, for what purpose are they to be trained? In practice, it is often necessary to answer the second question first in order to determine the training objectives, the subject-matter content and the methods to be employed should be clearly defined & stated. The development of a training program requires a careful and systematic analysis and evaluation of the areas of study to be included in the program (FAO, 1987).

The training content must be directly related to the objectives which have been determined for the program. The following steps may serve as a guide to determine the content of a program (Kellogg, 2001; and FAO, 1987):

- consider what change in knowledge, attitudes or skills is expected of each participant as a result of the training activity;
- List the important aspects that make up the subject matter content;
- Given certain facilities, resources and a time frame, select the most important topics that should be included in the program;
- Set up a priority list for topics for study;
- Break down major topics into more specific components in terms of behavioral changes desired; and,

- For each specific component make a list of the knowledge or skills a participant should develop.
- Consider the most appropriate location for the training in relation to the specific objectives.

2.6.2. Need for properly trained staff

For the selection of participants in training program, it is necessary to collect details of their background, i.e. their ages, sex, previous level of training or education, work experience, special interests or characteristics. Moreover, it is important to consider what advance information they require about the training in order to prepare themselves properly; arrange to supply this at an appropriate time. Furthermore, verify what the participants understand the objectives of the training program and accept the requirements in terms of commitment to the hours and nature of the work, etc. Finally, verify that they have been informed how the training will be of value to them, and consider if the program appears to meet fully the needs of the participants (FAO, 1987; Lofl and 1995).

The staff required to implement a program of forestry extension must differ from those engaged in general protection or production forestry duties in both attitude and technical knowledge. It should not be too difficult for a well trained forester to acquire the technical skills relevant to extension forestry but if he or she does not have a correct attitude to the task, technical skills in them selves will be of little value. Briefly, the social skills required consist of the ability to communicate on a number of different levels (FAO, 1987).

In the initial stages of a forestry extension program it is essential to provide appropriate training for staff and for members of the community taking part in the program. To avoid the inconvenience of travel over long distances, and to ensure that the training is relevant to local conditions and needs, reasonably comfortable and convenient training facilities to meet a variety of training needs should be available in at least one location in the district. It may be possible, however, to

make use of rural or agricultural training facilities where they exist, both to limit costs, and to achieve closer co-ordination with other types of development work (FAO, 1986).

Selection of staff and voluntary leaders for training should be based on; personal characteristics; basic educational or comprehension level, familiarization with training methods, meetings, lectures, discussions, demonstrations, etc.; communication with the public through home visits, group activities, office calls, public meetings and demonstrations; preparation and uses of written material; letters, leaflets, pamphlets, booklets, bulletins, newsletters; posters. Wall newspapers, display boards (FAO, 1988).

2.7. Communications of forestry extension program

Communication is the sharing of ideas and information forms a large part of the extension agent's job. By passing on ideas, advice and information, the extensionist hopes to influence the decisions of farmers. The agent must also be able to communicate with superior officers and research workers about the situation faced by farmers in his area. Any act of communication, be it a speech at a public meeting, a written report, a radiobroadcast or a question from a farmer, includes four important elements:

- The source or where the information or idea comes from;
- The message, which is the information or idea that is communicated;
- The channel, which is the way the message, is transmitted;
- The receiver, who is the person for whom the message is intended.

Any communicator must consider all four elements carefully, as they all contribute to effectiveness (FAO, 1985). Communication lies at the core of any extension program. Without good communication new concepts or technologies will not reach the people who might benefit from them. With out a reverse flow of information from the people, research worker or administrators will never

really know why promising ideas failed to gain acceptance or even what it is the people think they need to break through the barriers of low productivity or poverty (FAO, 1987). A good communicator listens more than he speaks. An extension agent who does not listen to farmers and engage in a dialogue with them unlikely to be very effective (FAO, 1985). Communication attempts to bridge the gap between the sources of ideas and potential users of them. It attempts to make available information or skills in a form the public can understand, examine critically, and incorporate into their regular practice, if they can see any benefit in applying them (FAO,1987).

2.7.1. Extension message

Mass media messages are short-lived and the audience may pay attention for only a short time, particularly where the content is educational or instructional. If too much information is included, much of it soon to be forgotten. This means that information provided through mass media should be: simple, and short; repeated, to increase understanding and help the audience to remember; structured, in a way that aids memory; and coordinated with other media and with advice given by extension agents (FAO, 1985; U.S. Department of Health and Human Services. 2000).

Forestry extension staff normally believe they have some important information and ideas which they hope the people will receive, understand and incorporate into their normal pattern of activities. The purpose or objective should be clearly defined in their own minds (Schooler, 1998). What change in behavior in relation to forestry do they want to bring about? Is it a change in knowledge, attitude, skill, or in what they expect the audience to do? The message must be relevant to the receiver. It should be of interest and appear attractive to him. It must be related to something he understands feels or thinks; something he can accept in relation to his culture and beliefs (Wallach and Dorfman, 1996). The preparation of a message can do a great deal to make it acceptable to the receiver. In

particular it should conform to accepted social standards and customs of speech, writing or illustrations. Differing treatments can make a message dull, boring, or even totally unacceptable to an audience (FAO, 1987).

2.7.2. Types of communication

The channel of communication may be classified as: visual; spoken; and, written. There are also combined methods, such as audiovisual which are often more effective than any of the channels used in isolation. Each method, however, has its advantages and disadvantages.

2.7.2.1. Visual communication

“Seeing is believing” is an important principle of extension education though it is not necessarily accepted fully in all societies amongst which forestry extension may seek to operate. Pictures, charts, diagrams, posters, exhibits, and displays can perform important communication functions in countries where people are familiar with the use of symbols (Garforth, 2003). Pictorial methods are now being used frequently and effectively to draw attention to forestry extension message in many countries. Staff must be Careful, however to verify that the illustrations and symbols used are properly understood and mean to the people what they are intended to mean. The use of colour in visual materials is important; if properly used it can greatly enhance the impact of visual materials (FAO, 1987). The term audio-visual aid to refer to anything that an extension agent uses to help to convey the message when communicating with farmers (Burton, et. al., 1997). The spoken word is the agents main communication tool, but whether the agent is speaking to a large village meeting or discussion a problem in a field with a group of farmers, its impact and effectiveness can be greatly increased by the use of suitable audio-visual aids. Audio-visual aids are only effective if they are appropriate to the situation and are used properly by the agent (FAO, 1985; Oakley, and Garforth, 1985)

2.7.2.2. Spoken communication

Spoken communication takes place regularly during individual contacts such as home or farm visits; enquiries made at offices; telephone calls; meetings, discussions and demonstrations of all kinds; and, radio and TV programs. Except for radio and TV these contacts allow two- way communication which has great advantages. The initial response or reaction of the recipient of a message may be as important for future planning as the content of the message itself. Lack of understanding can be detected in the reply and may be cleared up on the spot (FAO, 1987). While written communication is indispensable in the day- to-day operations of any organization, particularly an extension service. The advantages of written communication are

- It has greater status and carries more authority than oral communication, particularly if it carries an impressive official stamp;
- In some countries it is essential for any type of official business;
- It provides a generally low- cost method of spreading information to large numbers of people;
- When used in an interesting way, such as in attractive leaflets or magazines, it hold a readers attention and may stimulate him to seek more information on the matter; and,
- The material can be retained for as long as is necessary and is valuable for confirming detailed instructions given orally or by audio-visual methods.

Extension staff, in any field of work, must adapt their methods to the particular subject, to the ability of the audience to understand the different techniques used and to the facilities available.

Usually they will employ a combination of two or more channels of communication in the same meeting or presentation. A well written personal letter is attractive to many people (FAO, 1987).

2.7.3. The Receiver or the audience

The audience is made up of all those whom the communicator wishes to receive, understand and use the ideas or information he is presenting. If an audience is to make progress, an extension agent must help them to change their knowledge, attitudes and behavior. If no change takes place, there has been no effective communication and no progress. People are different in many ways. One major difference is in their ability to understand forestry ideas and practices. For this reason, communication sometimes fails because the communicator uses terms too difficult, or too unfamiliar, for an audience to understand. Forestry extension staff cannot expect much progress in getting people to plant tree crops on parts of their land if the idea is presented to them in words and expressions totally unfamiliar to them (Contant, 1979; FAO.1987).

CHAPTER III THE STUDY AREA

3.1. Location

The study area covers Khartoum State which is lies almost in the center of the Sudan in the North East part at the junction of the Blue and White Nile forming River Nile. Fig (3.1) shows the map of the study area. The State is located approximately between longitudes 36° E and 34° 25' East and latitudes 15° 9' N and 16° 45' North with altitude of 380 meters a.s.L (Khartoum State, 2000). The study area covers an area of approximately 1462.127 square kilometers, which is corresponding to 0.187% of the total area of the Sudan. The area included the three major cities, Khartoum, Omdurman and Khartoum North, situated at the confluence of the White Nile and Blue Nile forming the River Nile (Ali, 2000). The state is surrounded from the north by the River Nile State, from the South by Gezira State, by the White Nile State from south west and from south east by Kassala and Gedaref States (Ali, 2000).

3.2. Administrative structure

Khartoum State as it is the National Capital of the country, in comparisons with other Capitals of the World it is safety and settled, in spite of the combination of different tribes in the State. Khartoum City is the Capital of State and the Country and it forms the administrative capital and the historical capital is Omdurman. The state is divided to seven provinces and 36 unities (25 are Urban and 11 are rural unities). Table (3. 1) shows the administrative structure of the study area.

Table (3.1): Administrative structure of Khartoum State

Localities	Unities
Um Badda	ElBouga, ElSalam, ElAmeer, West Rural
Kararri	ElThoura, North Rural, Kararri
OmDurman	North OmDurman, South OmDurman, Abbot Saed, South Urban
Nile East	ElHaj Yousif, OmDounban, Wadi Soba, ElEsailat, ElJeraifat and Modem, WadAbo Saleh, AboDelaeg, AlAelafon
Bahari N	ElSilait, ElDroushab, ElHalfaya, ElMokhtar, Bahari
Jebel Elawlia	ElKalaklat, El Nasr, ElAzhari, White Nile
Khartoum	Khartoum West, Khartoum East, Khartoum Center, Khartoum
Elshohada	Elshohada, Soba and Elgerefate

Sources (Ali, 2000)).

3.3. Population

Khartoum State is characterized by its high density of population, because it is the national capital of the country. According to the third Sudanese population and housing census in 1993 the State population estimated to 3.512.144 million people, and in 2003 it amounted to 5.7 millions, the annual rate of increase is (4.04%). This is higher than the normal average of the country (2.83%), and this increase is due to continuous influx from other States. The populations of Khartoum State consist of nearly 86% of the population live in urban area and 14% in rural area (Ibrahim, 2006

3.4. Climate

The climate of the study area is tropical continental, characterized by hot summer, dry and windy winter (November-March). Generally, the climate of Khartoum State described as a semiarid. The state is characterized by relatively high temperature where it reaches its maximum in May and June (about 46C⁰) and the temperature is minimum in December and January (13⁰C) (Ali, 2000). Annual rainfall in Khartoum State is low about (124-161 mm/annum) and the evaporation potential is high the rainy season is a short period which extends from June to September. The maximum rainfall has been recorded in July and August.

Relative humidity in Khartoum State has low value throughout the year with mean of 29% (Ali, 2000).

3.5. Vegetation cover

Khartoum State falls in semi-desert ecological zone. According to the vegetation map of the Sudan made by Harrison and Jackson (1958), there are three minor sub-division of the semi-desert ecological zone; *Acacia tortilis* (*seyal*)- *Maerua crassifolia*(*sarah*) desert which occupied 90% of Khartoum State in which *Acacia tortilis* is a dominant woody species. In the north west of the state there is a very small portion of the semi arid zone named semi- desert Grass land on clay (Butana plain). The dominant species in this portion are *Acacia tortilis* in sand, and *Salvadora persica* (*arak*) grows a long seasonal water courses. In the semi-desert Grass land, the woody species *Acacia mellifera* (*kitir*) grows along the drainges of seasonal (Wadies). A long the Rivers banks the islands of Blue, White and the Nile Rivers, on a cultivated areas found; *Acacia nobica* (*laout*), *Ziziphus spina- christi* (*sidir*), *Acacia seyal*. *Faidherbia albida* (*haraz*) and occasionally *Balanities aegyptiaca* (*higlig*) (Van world wijk, 1984).

Forests covers about 25% of the State area the trees spread are; *Acacia nilotica*, *Acacia seyal* (*talih*), *Acacia ehrenbergiana* (*salm*), *Balanites aegyptiaca*, *Acacia mellifera* *Capparis decidua* (*tundb*) (Ali, 2000). The main varieties of the trees and shrubs are; *Maerua crasifolia*, *Commiphora africana*, *Acacia glaucophylla* (*luban*), *Leptedenia pyrotechinca*. All the trees and shrubs are of about 2-3 meters in hight. The Shrubs such as *Panicum turgidum* and *Cymhopogon proxmus* and many grasses, there is a thought that the plants of semi-desert covers about (33%) of the whole area in the past, the area which located between latitudes 16° and 18° 30' North (DECARP, 1976). The area of forests in the State are reduce, as a result of the high density of population and the wide civilizations development. There is only one forest lies in the center of city south of Al Engase

Bridge with limited area characterized by sunut tree so it called sunut forest and in the past it called (Jebel bawzar) forest.

3.6. Soil and topography

The soil of the study area is clay. the primary land covers in the study area are the water surfaces, agricultural field, (mostly irrigated) and some bare sands including vegetated areas. Narrow cultivated areas extended on both sides of the white, Blue Niles and the River Nile according to (Ibrahim, 2006). The study area is flat (380.00-390.00) meters above mean sea level. With only a few isolated hills in North and West of Omdurman City, there is also Jebel awlia hills in the South of Khartoum.

Khartoum State geological formation consists of the followings: Basement Complex (covering the North Eastern part of the State); the Nubian Sandstone formation (covers most parts of the State with different formations of Nubian sandstone formation); Gazira Formation (covers the area of state between the Blue and White Niles); and alluvial deposits which covers the area at banks of White and Blue Niles and different wades (Khartoum State, 2000).

3.7. Agriculture

The vegetation varies in the state according the nature of the soil and amount of rainfall. The climate of the State enables it to produce different crops in summer and winter; the important agriculture crop is Sorghum. Sundus and Alsilaite are agricultural schemes; Sundus Lies at the Southern region of Khartoum City is the main agricultural project in the area (Ali, 2000).

CHAPTER IV METHODOLOGY

4.1. Introduction

This chapter describes the scope of the research the target groups and sample selection. Moreover the data collection tool (questionnaire) is described in the form of its construction, validity and field testing as well as the procedures and methods followed for data analysis. The study was undertaken for purpose of assessing the afforestation programs at Khartoum State for the period 1997-2007. The central nursery (Soba nursery) serves devastative area in Khartoum and Gezira State. Almost all the localities of Khartoum State are covered by the central nursery activities, while for the Gezira State only the adjacent locality to Khartoum State is covered by the central nursery activities. Khartoum State is represented by two localities namely; Jebel Awlia, Elshohada and Soba while the Gezira State is represented by one Locality (ELBagair El Senaat). In this study, two types of data were used to collect the necessary information, namely primary and secondary data. The sources of the secondary data include FNC documents, files, articles, annual reports. While the primary data were principally collected as assessment of forestry activities of Khartoum forests State through the extension efforts more specifically, the data cover the main items of the objectives of the study mentioned in chapter I.

4.2. Selection of the study area

The kind of sampling techniques used in this research is simple random sampling. As mentioned earlier, the study covers two localities of the state, and the third one as abroad of Khartoum State.

4.2.1 Selection of farms

Selection of farms was done according to the distribution of the existing farms in the study area.

4.2.2. Data collection procedures

Data was collected from the different localities of Khartoum State namely: Jebel awlia, Al shouhada and Soba and Albagair Industrials locality.

4.3. Sample size

The sample size of the respondents was selected randomly and it represented 10% of the participants. Interviewees were chosen at random according to the availability of the participants. Telephone Communication facilitated the process of correspondence with the target group. Total of beneficiaries from the project is 770 and 10% of them (77) were selected for this research.

4.4. Designing of the questionnaire

The construction of the questionnaires was made according to the guidance of FAO (1989). The suggestion of the supervisor as well as ideas of other experts in the field of study was given special considerations. The first step in the questionnaire construction was the preparation of the draft questionnaire through conceptualization by drawing a list of data required, corresponding to specific objectives by choosing quantifiable parameters or indicators for the assessment of the private forest components program. For the provision of reliable, valid and accurate data, well-phrased items, the following guidelines of Burchinal (1986) was given special considerations in the questionnaire. The guidelines were:

- To be certain that each question was relevant to the topic and necessary.
- To ask the questions that the respondents can and are willing to answer.
- To express each question as simple as possible.
- To be sure not to use “double-parallel” question.
- To be certain not to use leading questions

- State questions in specific concrete terms.
- To obtain criticism of all prepared items by a colleague or a friend.
- To state the items in the language respondents use in conversation

The main contents of the questionnaire are: general characteristic of respondents, seedling production and distributions, afforestation activities at the farm level, species preference for agro forestry intervention, and constraints and measure of risk confronting tree planting at the farm level. Two types of questions were used in the questionnaire. Closed-end items with mostly multiple choices or yes and no style of answers or tables; and dichotomous questions in a step-wise style, each answer leading to a specific set of follow up questions with no open-ended items except where it is inevitable. These types of questions were used in the questionnaire in order to:

- Make the least demands upon respondents.
- Permit quick, efficient collection of data.
- Permit easy, quick and accurate analysis of answers.
- The combination of question and associated response categories sometimes help respondents to understand the question more clearly.
- They are more useful in obtaining answers to sensitive questions.
- Explanation of the purpose of the study and why it is important.
- Explanation of how the respondents were selected.
- Assurance that answers would be protected and not made known to any one else to assure confidentiality.

4.5. Pre-testing

The formulation of the questionnaire was followed by a pre-test to discover and correct any flaws in it. The purpose of the pre-test is to make sure that the questionnaire would deliver reliable and valid data for answering the problem under investigation. The final year students of faculty of Forestry, University of

Sudan, as a part of their study course, were asked to critique the questionnaire, and to estimate how the respondents will be able to respond to the questionnaire. According to the comments of the students, the draft questionnaire was revised. Finally, the supervisor checked the questionnaire, and accordingly, some questions were ignored. After the pre-testing, the contents of the questionnaire were materialized into simple forms with minimum items to obtain necessary information. The questionnaire was finally revised and printed (Annex (1)).

4.6. Permission for data collection

Prior to the start of the data collection, the general manager of the FNC was informed about the nature of the research and the study area. Request letter was addressed to the general manager of the FNC to issue a directive to the regional forest officers involved in the participatory forestry activities to offer the possible assistance and to help in data collection.

4.7. Statistical analysis

The statistical analysis was commenced through exploratory Manipulations of the data obtained in the study area. This process was accomplished by critically examining the data through the use of simple techniques of analysis. The main tools are the construction of simple tables and graphs and selected cross-tabulation which allows tentative answers to many of the Questions being asked in the survey. Frequency distribution is used to describe some variables of the study. The data is presented in percentages of answers received for the various questions asked, with the total responses presented as aggregates at the bottom of each table.

CHAPTER V RESULTS AND DISCUSSION

5.1. General characteristics

The general characteristics of the respondents are of great importance and can be used as a monitor for forecasting the success of the extension programs. Gender, educational levels, and source of income influence directly or indirectly the efficiency of the extension programs. In the study area information concerning the above mentioned variables was considered to assess the prospective of the extension programs. Gender assessments studies can be useful as planning instruments to achieve the desired effects for women, leading to improvement in their position and prospects of life. Table (5.1) shows the distribution of the respondents with regards to gender and educational level.

Table (5.1): Gender and education level of respondents

locality	N	Male %	Illiterate or khalwa %	primary %	Secondary %	University %
Jebel awlia	17	100	17.7	11.8	41.2	29.4
Elbagair	40	95	30	10	32.5	27.5
Elshohada	20	100	15	5	5	55
Total	77	75	18	7	18	27
Average %	25.7	97.4	23.4	9.1	27.3	35.1

The sample of respondents consist of both gender dominated by male 97.4% of the respondents), while females represent 2.6% of the respondents. The dominance of males in the selected sample is attributed to their engagement in farming activities. This finding agrees with EL Hadi (2005) who emphasized that subtle involvement of women in the activities of farming and community forestry in Khartoum State. Moreover, this finding disagrees with the assumption of (COWI consult, 1991) which emphasized that forests are often a major source for paid employment for women in the Sudan much of what they gather from the

forests activities is processed and marketed to bring in supplementary cash for the family.

As far as the educational level is concerned, it can be considered as a monitor to detect the possibility of creating changes in attitudes and raising of awareness for the sake of sensitizing and mobilizing local communities to conserve the vegetation cover in the study area through adoption of different forms of communal forestry activities. Table (5.1) shows the different educational level in the study area. The level of education is fairly good in the study area where about 35.1% of the respondents pursued their education to university level, while 27.3% to the secondary level. The illiteracy level and pre-school education (khalwa) are relatively low (14.3 and 9.1%, respectively). The good level of education is attributed to the availability and affordability of education at the capital beside the financial wellbeing of the respondents who possess the farms at the state. The level of education encouraging to deploy different extension methods, particularly pamphlets and handouts, to disseminate information and enhance adoption of new interventions. This agrees with Al Khidir (2005) who emphasize that educated people are potentially capable of following instructions and interpret extension messages compared to illiterates.

5.2. Sources of income

Reliance on farming as a source of income is not enough to meet the daily needs of households either due to lack of encouraging policies or lack of economical feasibility. Accordingly, farmers manage to support their income from other economical activities Fig (5.1) shows the source of income of the respondents in the study area. About 64.9% of the respondents rely on farming as the main source of income generation, while private business was mentioned by 52% of the respondents. Private business is represented in handicraft, trading and small scale enterprises. Government post was mentioned by 27.3% as the main source of income. Some other respondents (10.4%) mentioned other sources of income.

Since the majority of the respondents rely on agriculture as a source of income a special extension program should be directed to this groups since most of them are motivated to adopt new interventions. Animal rearing was mentioned by 1.3% of the respondents as a source of income. This finding is verified by the fact that there are no practices of integrated agriculture which incorporate animal component in the farm practices.

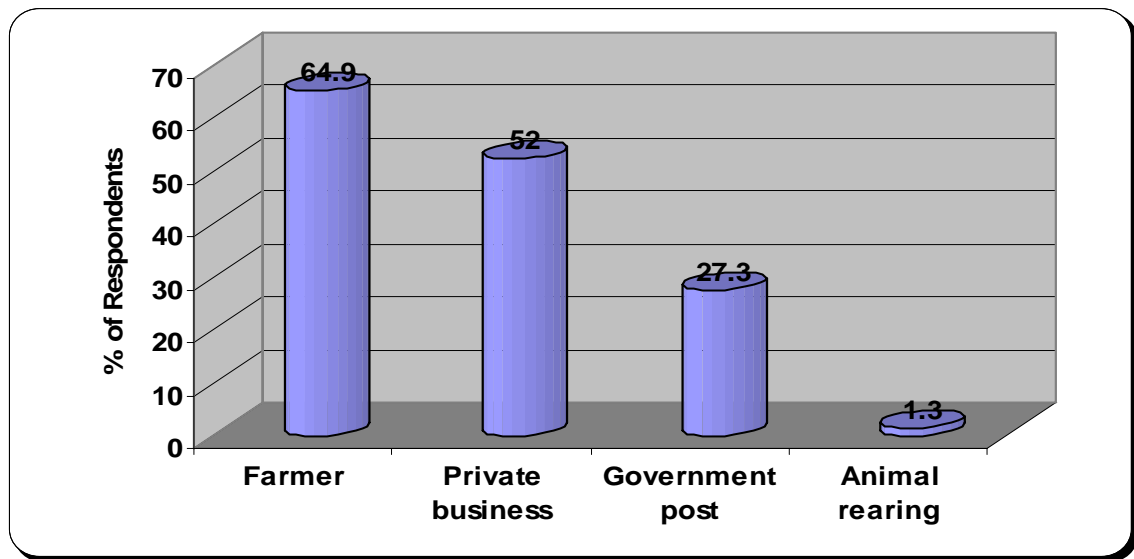


Fig. (5.1): Sources of income in the study area

These findings agree with El Hadi (2005) who clarified that agriculture is a complementary source of income to farmers in the study area. This situation makes it difficult to approach farmers for sake of adoption of new interventions or the real owners are not accessible.

5.3. Land tenure

The problem of land ownership is one of the most serious problems in the history of the forest lands when lands assigned for forestry practices. Forest lands are usually acquired by inheritance (Barrier, 1982) and accordingly losses it title for practicing forestry (Benner, 1982). In order to forecast the prospects of social

forestry it is worth assessing the type of land tenure in the study area. Table (5.2) shows land owner and trees cover in the study area.

Table (5.2): Land tenure and the vegetation cover in the study area

Locality	N	Owner %	Hicker %	Rent %	Other %
Jebel.awlia	17	11.8	41.2	47.1	0
Elbagair	40	77.5	5	12.5	5
Elshohada	20	75	0	5	15
Total	77	48	9	14	5
Average %	25.7	62.3	11.7	18.2	6.5

The situation of land tenure in the study area varies. Free ownership is the dominant method of land holding among the respondents as stated by 62.3% of the respondents. The type of land ownership is very important for the development of agriculture. In the Sudan the right of land ownership is organized by the land settlement and registration ordinance of 1925. By this ordinance, all unregistered land is deemed to belong to the Government but in practice the Government exercises its ownership as a trust for the people who have acquired rights over it, whether communal or individual. While 18.2% of the respondents stated that they possess the farm land through rent. This type of ownership is common in the study area, where the real owners are engaged in other activities and they can not spare some time to administer their farms. Accordingly land renting emerges as a reasonable solution. About 11.7% of respondents own the land as hicker. Other types of land tenure include crop sharing and release hold to relatives and friends as asserted by (6.5%). El Haddi (2005) stated that, land tenure is one of the most sensitive issues concerning resilience of local communities. This agrees with (Wilkins, 1978) who showed that under the condition of inheritance, the ownership is subjected to changes in a form of reduction in land size and as a result considerable area have to be cleared to provide a vacant lot for the family.

5.4. Source of seedlings

The entire interviewed sample asserted that they are aware about the nursery techniques and the different silvicultural operations necessary for seedlings development. They mentioned different sources for their seedlings. Table (5.3) shows source of seedlings and seedlings transportation. The majority of respondents (58.4%) emphasized that FNC nurseries are the sources from which they obtained their seedlings for the afforestation program, while 49.4% mentioned private nurseries as sources for their seedlings. Farmers used to obtain seedlings of horticultural trees from private nurseries because such seedlings are not available at FNC nurseries.

Table (5.3): Sources of seedling & seedling transportation

Locality	N	F.N.C %	Private nursery %	Personnel selection %	Rent Cars %	Forests Cars %	Private Cars %
Jebel awlia	17	29.4	70.6	17.6	76.5	0	23.5
El bagair	40	70	47.5	12.5	75	0	25
Elshohada	20	55	35	15	85	10	5
Total	77	55	38	11	60	2	15
Average %	25.7	58.4	49.4	14.3	77.9	2.6	19.5

Some respondents (14.3%) clarified their ability to produce their needed seedlings at their farms. Members of this group had received intensive training during the early phases of FINNIDA project in the study area.

Seedlings transportation can be consider as the most sensitive stage in the process of seedlings production. The mortality of seedlings after planting is attributed to improper transportation of seedlings. Table (5.3) shows the different means used for the transportation of seedlings. The majority of the respondents (77.9%) asserted that they rely on rent cars for transportation of seedlings from FNC nurseries in the study area, while 19.5% rely on private cars for the transportation of seedlings. Few respondents (2.6%) stated that they rely on the FNC cars for transportation of seedlings. All the member of this group are from Soba where

the central nursery located. It seems that the closeness of the area to the nursery encourage the FNC personnel to encourage farmers to adopt tree planting through the incentive of seedlings delivery. This agrees with El Hadi (2005) showing that one of the strategies of FINNIDA project was to encourage the participation of farmers in the adoption of tree planting based mainly on intensive extension services and delivery of seedlings to farmers at their farms.

All the respondents who mentioned the FNC nursery as a source of seedlings stated that they found all the seedlings they need available at the nursery free of charge. While 41.6% asserted that they did not find all the seedlings they need for their farms. The process of adoption of tree planting started since the seventies of the last century as stated by the majority of the respondents. Table (5.4) shows the time trend of seedlings distribution at the study area.

Table (5.4): Availability of seedlings and time series of seedlings distribution

Locality	N	Available seedlings %	Not available %	1978 %	1983 %	1988 %	1990 %
Jebel awlia	17	41.2	52.9	0	5.9	0	5.9
Alba air	40	60	42.5	5	0	0	0
Soba	20	70	30	0	0	5	0
Total	77	55	32	2	1	1	1
Average %	25.7	58.4	41.6	2.6	1.3	1.3	1.3

Some respondents stated that they have started cooperation with the central nursery since 1978 as mentioned by 2.6% of the respondents, while some others mentioned the periods 1983, 1988 and 1990 with a similar percentage (1.3%). The rest of the respondents stated that they started cooperation with the nursery after the nineties of the last century.

All the respondents who received seedlings during FINNIDA project asserted they received it free of charge. Moreover, they declared the project was responsible for the delivery of seedlings to farmers at their farms besides

provision of extension services in the fields of seedlings protection, planting and irrigation intervals. The rest of respondents, who cooperate with the central nursery, after the phase-out of FINNIDA project, stated that they received seedlings free of charge for forestry tree species only. Some species are distributed to farmers at a reasonable cost like date palm trees, mango, lemon and jawafa. Latter even kafur seedlings are distributed with a reasonable cost

5.5. Types of trees in farm

As mentioned earlier, different types of regeneration methods are used in the study area. This indicates that some trees are native to the site while some others introduced by farmers. Table (5.4) shows the tree species in the study area. The majority of the respondents (71%) planted (Kafur) trees *Eucalyptus camaldulensis* at their farms. This might be attributed to the fact that at the early stages of FINNIDA project reliance on this species was very high where the project planned to rely on *Eucalyptus spp* for the different interventions in the study area. About 37.7% of the respondents stated that they planted (Neem) *Azadirachta indica* trees at their farms, while (Damas) *Conocarpus spp.* was mentioned by 27.3%. Dign EL Basha *Albizia lebbeck* was mentioned by 24.7% of the respondents.

Tree planting as shown in Table (5. 5) is not confined to forest tree species only; horticultural trees also receive consideration in the farms at the study area. Lemon trees exist at farms as indicated by 41.6% of the respondents, while mango trees were mentioned by 27.3%. Date palm trees also exist at farms as mentioned by 38.2% of the respondents. Farmers are keen to raise these horticultural trees for sake of supplementing and diversifying their income.

Table (5.5): Trees grown at farms in the study area

Locality	N	Kafur %	Lemon %	Neem %	Palm %.	Albizia %	Mango %	Damas %
J.awlia	17	82.4	5.9	35	35.3	41.2	0	5.9
Elbagair	40	70	62.5	40	43.6	17.5	37.5	37.5
Elshohada	20	65	30	35	30	25	30	30
Total	77	55	32	29	29	19	21	21
Average%	25.7	71.4	41.6	37.7	38.2	24.7	27.3	27.3

5.6. Designs of tree planting at farms

Agro forestry intervention takes different forms (alley cropping, hedgerows, windbreaks, and live fence, strips and park lands). The farm area sometimes is a determinant factor for the selection of agro forestry models (Sen and Das, 1987). In the study area the respondents plant trees in their farms by different models. Fig (5.2) shows the different models adopted by the respondents in the study area.

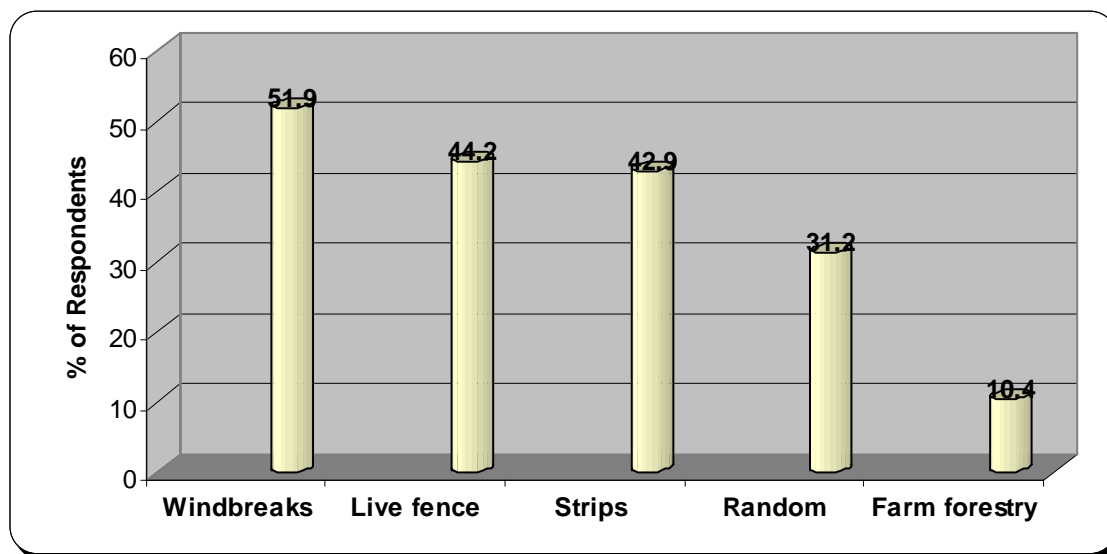


Fig (5. 2): Agro forestry models in the study area

About 51.9% of the respondents asserted that they planted trees in the form of windbreaks i. e. in two sides of the farms to be perpendicular to direction of prevailing winds which blows either from north to south or vice versa. Kafur and Damas is the main tree species planted for this purpose as indicated by the members of this group. Some members of this group among the different reasons

mentioned for the purpose of adoption of windbreaks are protection of poultry which is used for poultry production. While 44.2% stated that they plant the trees at their farms in the form of live fence because trees are relatively lower in cost compared to other materials (barbed wire). Kitir is mainly use for the establishment of live fence as mentioned by the members of this group. About 42.9% of respondents stated that they planted trees in the form of strips (alternating strips of agricultural crops and trees). Random distribution of trees at farms (parks land) was mentioned by 34.2% of respondents, while farm forestry was mentioned by 10.4% of the respondents. The members of the last group stated that agricultural production has become no longer profitable. Accordingly they converted the agricultural lands to farm forestry where no agricultural crops are planted with trees.

5.7. Trees adoption at farms

The notion of agro forestry calls for adoption of tree component in the farms after realizing the benefits gain from such intervention. Trees can be adopted in farms in different forms like windbreaks, shelterbelts, hedgerows, alley cropping and others.

The central nursery at soba, as mentioned earlier, cover parts of Khartoum and Gezira states. Fig (5.3) shows seedlings distribution in the study area for the period (1997 – 2007). The number of respondents varies considerably among different sites, being high in Soba where 199 farmers participated in the afforestation program, followed by farmers from Butri (184).

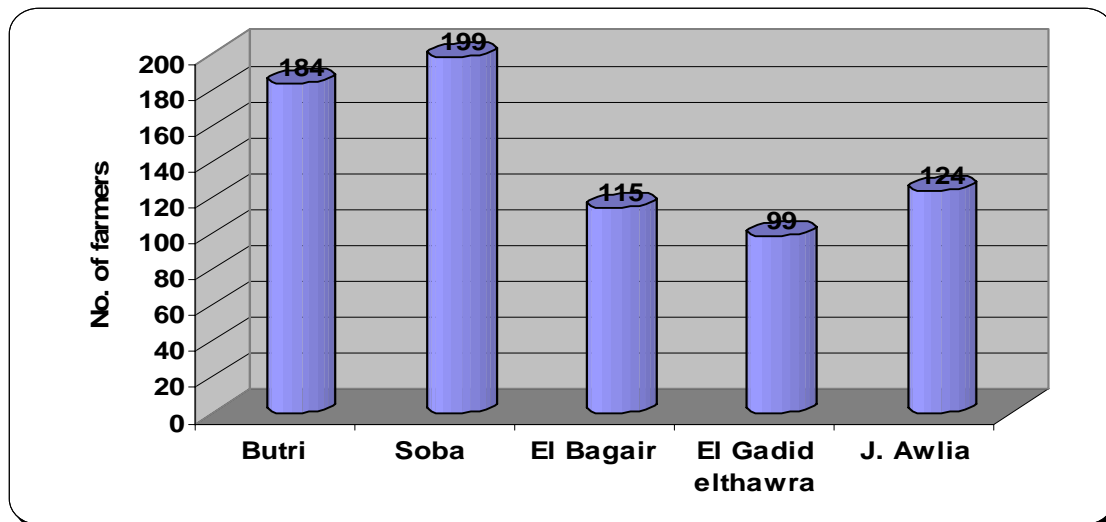


Fig (5.3): Farmers participated in the afforestation program (1997–2007)

This finding could be verified by the fact that Soba and Butri are closer to the central nursery and this facilitate the process of communication between the extensionists and the clients since field visits are not expensive compared to other sites. El Bagair and Jebel Awlia showed a moderate number of farmers participated in the afforestation program, while El Gadid either showed the least number of farmers for the period (1997 – 2007).

It is apparent that the farmers at the study area realize the importance of trees at farms where 90.9% of the farmers asserted that they possess trees at their farms. This high awareness might be attributed to the efforts exerted by the different NGOs worked in the study area and the presence of an effective extension unit within the FNC. Sixty-one per cent of the interviewed sample asserted that they followed artificial regeneration to afforest their farms (plantations), while 29.9% accentuate that the trees at their farms are naturally regenerated supplemented with artificial regeneration

About 9.1% of the respondents stated that they have not adopted tree planting at their farms. All the member of this group asserted that they were approached by the extension unit in the study area, but they have reasonable factors hinder their

adoption of trees at their farms. Table (5.6) shows the different factors mentioned by the respondents.

Table (5.6): Tree planting at farms

locality	N	Lack of tree planting			Types of tree planting	
		Poor growth %	Reduce crops %	Not economical %	Plantation Trees %	Natural & Plantation Trees %
J. awlia	17	29.4	11.8	5.9	58.8	11.8
Elbagair	40	5	5	5	47.5	52.5
El shohada	20	10	30	5	90	0
Total	77	9	10	4	47	23
Average %	25.7	11.7	13	5.2	61	29.9

About 11.7% of the respondents accentuated that they have tried tree planting at their farms but the growth performance of the seedlings was not encouraging, and they have not repeated the trial of tree planting at farms. This factor can be tackled by the extension unit in the study area to assess the mortality of seedlings at farms to stand on the real factors behind the poor development of seedlings. Thirteen per cent asserted that their land holdings are small and they can not assign some parcels of their land for tree planting because it will be in the expense of the agricultural crops. The extension unit has to formulate a special extension package to address adoption of trees on small farms relying on windbreaks or live fence on the periphery of the farms which will not reduce the cultivable area. While 5.2% mentioned lack of economical benefits from introducing trees at their farms. The extension unit should raise the awareness about the benefits of tree planting adoptions at farms other than the economical benefits.

5.8. Sources of irrigation

Water represents a bottle neck for the success of afforestation programs. The study area falls within the semi-arid zone of the Sudan with rainfall varies between 75 – 100 mm per annum (Ali, 2000). This amount of rainfall is not enough to secure satisfactorily agricultural production and tree development. The majority of the respondents (89.6%) asserted that they rely on pump irrigated cultivation and this is mainly due to the closeness of the farms to the Blue Nile in the study area. Fig (5.4) shows sources of irrigation at farms in the study area.

Farms which lies a distant a part from the Blue Nile and White Nile , farmers attempts to rely on wells for the provision of irrigations water as stated by 9.1%of the respondents. This group consists of well to do farmers who are financially capable of digging wells.

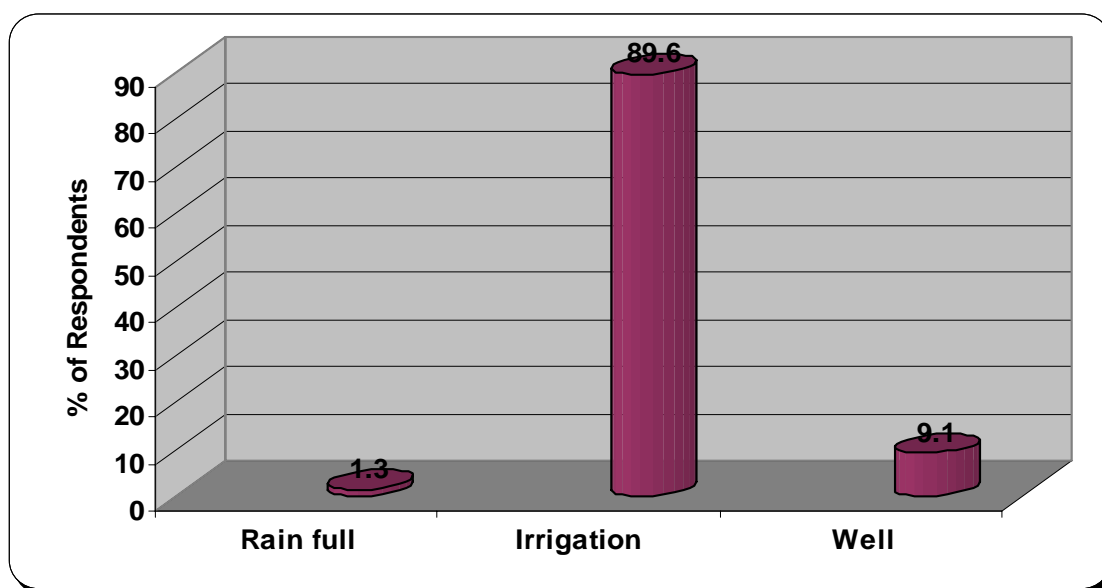


Fig (5.4) Source of irrigation water at the study area

Few respondents (1.3%) showed that they rely on rain fall agriculture. Members of this group are either small farmers or they are not economically motivated to rely on irrigation at their farms.

5.9. Seedlings distribution in the FNC Central Nursery (Soba)

The Soba central nursery started with high capacity in seedlings production, where the nursery started with production of 1.500 million seedlings per year. Successfully the nursery supplied all the targeted areas in Khartoum and Gezira states. After the phase out of the project, seedlings production and distribution witnessed a sharp drop. The main factors behind the decline in the distribution of seedlings are attributed to the fact that the nursery was established with high standards. Almost all the inputs of the nursery were brought from Finland (including the peat and polythene backs). The FNC which is always under funded is incapable of covering the running cost of the nursery particularly provision of necessary inputs. The FNC attempted to deal with the new situation (withdrawal of FINNIDA) through imposing some fees on the seedlings which are distributed free of charge during FINNIDA period but still the level of seedlings distribution remain low. Moreover, the extension unit became ineffective either due to lack of means of transportation or reduction of the staff number in the nursery. Fig. (5.5) shows seedlings distribution for the period (1997 – 2007).

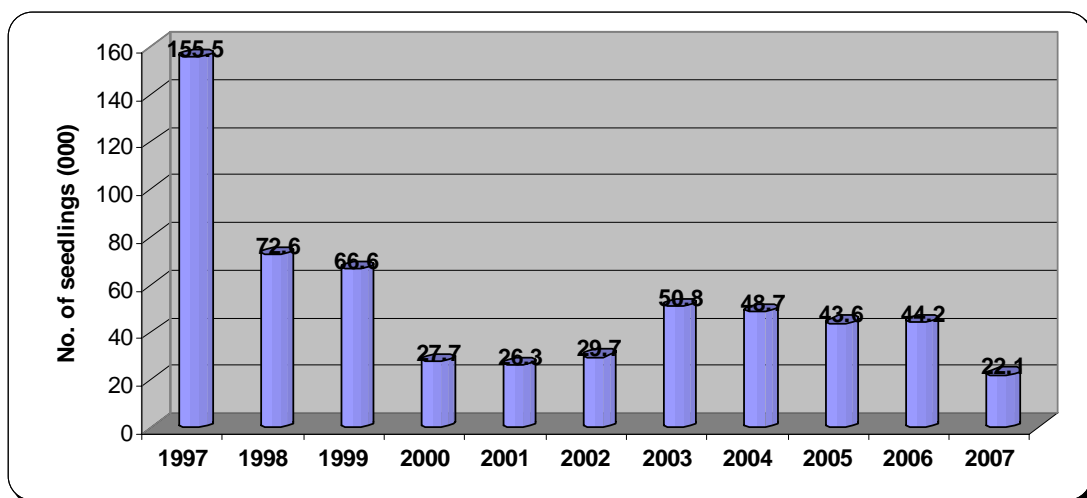


Fig. (5.5): Seedlings distribution for the period 1997 – 2007

Seedlings distribution in year 1997 reached 155500 seedlings across the study area. In the next year (1998) seedlings distribution showed a dramatic decline, more than 50% of seedlings distributed in year 1997. Despite the high drop in seedlings distribution in year 1998, this number remained the highest for the rest of the period (1999 – 2007). Seedlings distribution for this period showed a fluctuating pattern, being low in years 2000, 2001 and 2002 and increased in the year 2003 before showing a continuous decline where year 2007 showed the lowest number of seedlings distribution. Till the year 1999 there was an active unit of extension and there were available extension tools like cars and audio visual coupled by farm visits.

5.10. Dissemination of information regarding the Central Nursery

It is highly acknowledged that FINNIDA project was behind the idea of adoption of agro forestry intervention in Khartoum State and neighboring localities of Al Gazira State. The project relied on sophisticated inputs to guarantee a satisfactorily and steady supply of seedlings. It worth mentioning that, the project focused on rehabilitation of Khartoum greenbelt, but unfortunately the belt diminishes and faded away. The extension unit of the project was the strongest circle of the chain of success. Field visits were deployed as a vital mean to sensitize and mobilize farmers to adopt trees at farms. The situation turned up side down with the phase out of the project where in the past the project is backed by good financial support. After the phase out of the project the FNC which is always under funded was not able to secure the necessary fund to run the activities of the project. The local people were asked to assess the present extension services in the study area. Fig (5.6) shows the knowledge of the farmers about the FNC nursery at Soba.

About 27.3% of the respondents stated that they come to know about the nursery at Soba because they reside at Soba, while 15.6% asserted that they know about

the nursery from the mass media (TV, radio and press). A similar per cent of respondents (15.6%) stated that they were familiar with the nursery from other people who have direct or indirect contact with the staff of the nursery. The role of the extension unit in the dissemination of information regarding Soba nursery is mentioned by 9.1% of the respondents.

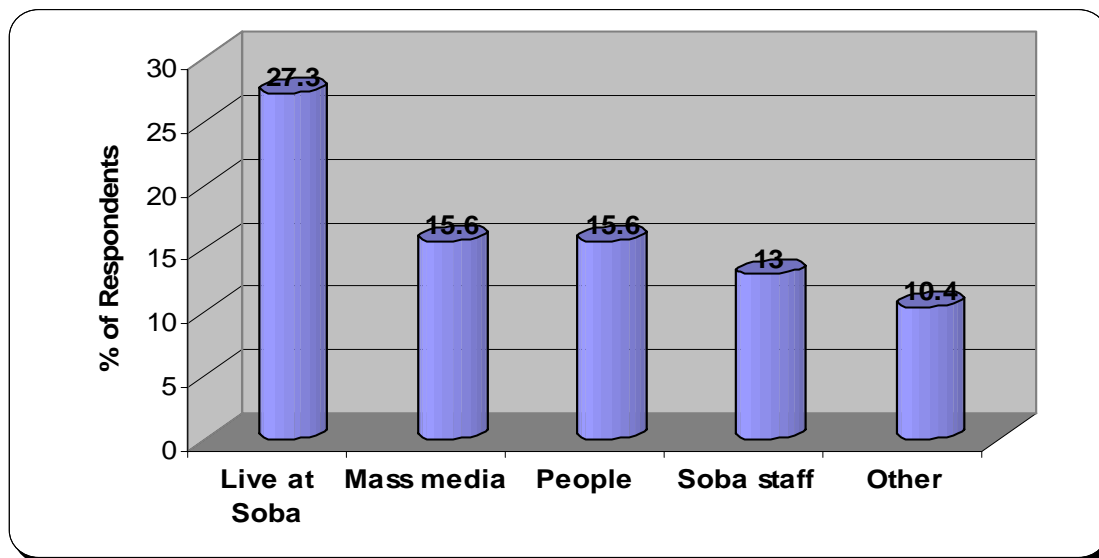


Fig. (5. 6): Sources of information about Soba Central Nursery

5.11. Purposes of trees

The notion of agro forestry calls for the adoption of tree component in the farms for sake of restoring soil fertility and increasing productivity of agricultural crops through adoption of windbreaks intervention. In the study area the respondents adopted tree planting at farms for different reasons. Table (5.7) shows the selection of tree species for afforestation and the purpose behind selection.

Table (5.7): Selection of tree species and aims behind its selection

Locality	N	Interest %	Protection %	Firewood production %	Building %	Fodder %	Other %
Jebel awlia	17	76.5	88.2	64.7	5.9	5.9	23.5
E bagair	40	85	72.5	7.5	5	2.5	65
Elshohada	20	65	75	15	5	10	30
Total	77	60	62	18	4	4	36
Average %	25.7	77.9	76.6	22.1	5.2	5.2	46.8

A very simple and quick answer is that people plant trees because they need them. This answer is, however, too general. It does not tell an enquirer what species of trees are planted, what particular human needs they serve, when the trees are planted or why they are planted in particular places. The question whether the produce is shared by only those who planted and cared for the trees or by a wider group remains unanswered. It is often said that people in general do plant trees. This is a conclusion based on the assumption that special expertise and learning are required to choose a tree species suited to the soil and climate of an area, to maintain the tree and then to harvest the produce.

From the above table, 77.9% of the respondents stated that they made the decision for the selection of the species to be planted at the farms and the rest of the respondents stated that the selection of the species was made by the extension unit of the central nursery. The respondents mentioned different factors responsible for their preference of tree species and the objective behind their selection. About 76.6% of the respondents accentuated that they adopt trees at farms for sake of protecting the farms' top soils from being eroded by wind and to protect the farms against winds and dust storms. While 22.1% stated that they adopt tree planting for sake of providing fuel wood which has high market demand. Some respondents (5.2%) mentioned provision of fodder as the purpose behind the adoption of the trees at farms. A similar per cent of respondents attributed the reason of tree planting adoption at the farm to provide building

materials which has reasonable prices in the study area. Most of the buildings of the outskirts of the state are made of traditional models in which the woody poles are the principal component. This agrees with Falconer (1987) showing that there is a high demand on poles with reasonable prices attracted the farmers to invest in tree planting, because the high percent scored by respondents that their purposes to planting trees for protecting their farms. It worth mentioning that the Forest policy of 1986 call for the enforcement of signing 5% and 10% of irrigated and rain fed farms, respectively, for tree planting. Therefore, the extension unit should emphasize this issue on farmers who did not adopt tree planting at their farms.

5.12. Evaluation of trees plantation

It has been suggested that the purpose of forestry extension evaluation is to keep people honest about what they are doing. It is easy to get emotionally committed to a programme and fail to realize that mistakes are being made. Successes may, on the other hand attributed to good luck without considering their underlying causes. It is necessary to be honest about failures and successes (FAO, 1986). Table (5.8) shows evaluation of the afforestation program in the study area as perceived by the respondents

Table (5.8): evaluation of trees paid

locality	N	Evaluation of tree planting %	Seed %	Irrigation %	Protection %	Land preparation %	Other %
j. awlia	17	88.2	17.6	0	5.9	11.8	11.8
El bagair	40	75	5	0	7.5	15	20
Elshohada	20	80	5	5	10	5	5
Total	77	61	6	1	6	9	11
Average %	25.7	79.2	7.8	1.3	7.8	11.9	14.3

About (79.2%) of respondents asserted that they have never considered the cost of establishment or the benefit of tree planting adoption in monetary terms, while the rest state that they have adopted the intervention with economical benefits in

their minds. Therefore, the cost of establishment of the afforestation program at the farms is out of the minds of farmers. Few respondents (11.7%) stated that they have considered the cost of land preparation for tree planting, while the rest of the respondents stated that this cost is very low therefore, it was ignored in the assessment of the cost of establishment. Only 7.8% considered the cost of seedlings and their planting. A similar per cent of the respondents stated they considered the cost of establishment in their accounts, while 14.3% mentioned other costs considered in the general costs of their farms. This finding agrees with EL Hadi (2005) who mentioned that none of the farmers in the state was able to give an estimate of the costs of establishment of the plantations. The main reason behind this might be due to the fact that the real titleholder of the farm is not directly involved with the monetary issues of the tree components or the different operations are made by different persons at the same farm.

5.13. Benefits of planting trees

The most important challenge of today's world is to establish a system which meets both basic needs of the people and ensures sustainable management of natural resources (UNEP, 2006). Trees are adopted at farms in order to attain certain objectives which vary considerably from one farmer to another. In the study area the respondents mentioned some benefits they expect to gain from tree planting adoption. Table (5.9) shows the benefits of trees at farms as perceive by the farmers.

Table (5.9): Benefits of trees at farms in the study area

Locality	N	Economical benefit %	Shade %	Fruit %	Windbreak %	Aesthetical value %	Other %
J. awlia	17	11.8	29.4	52.9	100	5.9	11.8
Elbagair	40	65	40	17.5	60	20	30
Elshohada	20	30	20	20	65	30	25
Total	77	34	25	20	56	15	25
Average %	25.7	44.2	32.5	26	72.8	19.5	24.7

Windbreaks intervention receives special consideration at farms in the study area. This fact is supported by 72.8% of the respondents. Farmers clarified the reasons behind the adoption of this intervention. The entire members of this group asserted that they attempt to protect their farms from the dust storms and soil erosion by wind, while some of them mentioned amelioration of microclimate through reducing the temperature as one of their objectives behind the establishment of windbreaks. Increase of returns from farms through planting horticultural trees was mentioned by (26%) of the respondents. This verifies the existence of citrus, mango and date palm trees in most of the farms. This fact is supported by 44.2% of the respondents who stated that they adopt tree plant at their farms solely for gaining economical benefits from both horticultural and forest trees. Some respondents (32.5%) accentuated that they plant trees at farms for sake of providing shade. It is known that the temperature during the agricultural season reach high level which is harmful to farmers and their crops. Provision of shade reduces temperature and accordingly ameliorates the microclimate. About 19.5% of the respondents stated that they planted trees at their farms in order to increase the aesthetical value of their farms, while 24.7 mentioned different other benefits from trees at their farms.

Agro forestry is frequently involved as a solution to problems of land and water degradation as well as an answer to shortage of fuel wood, cash income, and animal fodder, building materials and improving land use. Agro forestry is the promise of nitrogen fixing trees for improving soil fertility in cropland and pastures, as has the resistance of some trees to drought. Also contribute to high nitrogen tree fodder to livestock and the pastures (Rocheleau, 1988). However, the success of participatory forestry programs, irrespective of the models, depends largely on effective people's participation at various stages of their implementation. Many social forestry programs have stumbled along and eventually faded away. The downfall of these programs is partially a result of the non-integration of social forestry projects within the field of rural development

and partially a result of implementers who did not seek the active participation and involvement of the local people (Sen and Das, 1987).

5.14. Factors behind lack of agro forestry adoption

Despite the expected benefits gained from adoption of agro forestry models, some farmers misconceive the notion of agro forestry. Fig (5.7) shows the allegations of farmers who are opponent to the idea of agro forestry intervention.

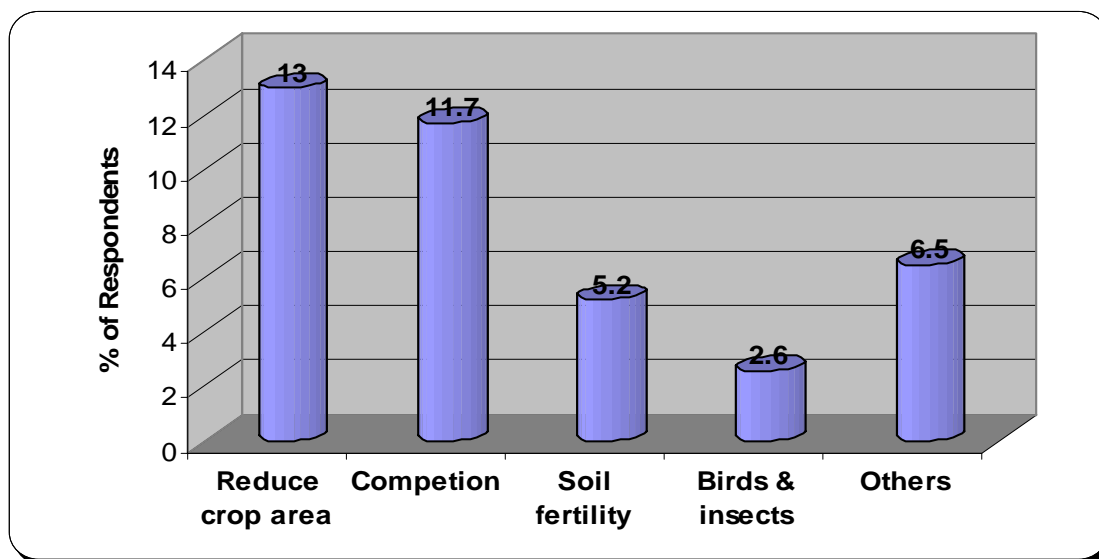


Fig (5. 7): Factors behind opposing agroforestry intervention

About 13% of the interviewed sample asserted that tree planting at farms reduces the area for cultivation of agricultural crops. Member of this group possess small agricultural areas therefore it is difficult for them to assign some parcels for tree planting.

Some respondents (11.7%) stated that competition between trees and agricultural crops for light, nutrients and soil moisture are behind their lack of adoption of agro forestry models, while 5.2% perceive deterioration of soil fertility can be attributed to trees which exhaust soil nutrients. Birds and insects damages were mentioned by 2.6% of the respondents under the allegation that trees harbor these

agents which are destructive to agricultural crops. Other reasons were mentioned by some respondents (6.5%).

5.15. Constraints and measures of risk confronting tree planting in farms

Table (5.10) shows constraints and measures of risks confronting tree planting at the study area. Some respondents 16.9% asserted that the amount of rainfall in the study area is not encouraging to plant trees at farms. To plant trees at farms necessitates additional cost for irrigation. About 32.5% mentioned lack of fencing represent a real challenge for the development of seedlings because of roaming goats at the study area. This fact is supported by 31.2% of the respondents showing that overgrazing hinder the efforts of afforestation program through agro forestry. The respondents were able to mention some other factors which restrict the activity of tree planting.

Table (5.10): Constraints confronting adoption of agro forestry

Locality	N	Few rain %	Over grazing %	No protection %	No incentives %	Poor extension %	Other %
J. awlia	17	17.6	64.7	58.8	58.8	50	23.5
Elbagair	40	17.5	22.5	12.5	50	64.7	57.5
Elshohada	20	15	20	50	75	50	45
Total	77	13	24	25	45	46	36
Average%	25.7	16.9	31.2	32.5	58.8	60	46.8

Sixty per cent of the interviewed sample asserted that the extension services are not encouraging to adopt agro forestry model. The efforts of the extension service focuses on distribution of seedlings with reasonable prices, but no demonstration or transfer of technical know how are introduced by the extensionist Moreover, 58.8% accentuate that they are not motivated to adopt the intervention of agro forestry.

This clearly reflects the importance of forestry extension to increase the awareness of trees among the farmers in the study area. It is true that there is an efficient extension unit in the study area, but it need to update the extension messages directed to the clients to reveal any ambiguities regarding adoption of tree planting at farms.

5.16. Reasons of seedlings mortality

The entire interviewed sample asserted that they have visited the central nursery several times for sake of having seedlings. They asserted that the mortality of seedlings during transportation and transplanting at the farm is relatively high. They attributed this mortality to several factors. Table (5.11) shows the responses of respondents regarding seedlings mortality. Seventy-four per cent of the interviewed sample attributed the mortality of seedlings to insects' infestations at the farms. Farmers are not applying pesticides to their crops due to its high cost. Accordingly, seedlings are subjected to damage by theses insects. While 27.3% of the respondents mentioned short of water after transplanting is the main factor behind the mortality of seedlings. The majority of the farms in the study area are pump irrigated cultivation. Any damage in the pumps or lack of spare parts make the agricultural season liable to loss. The same is true for seedlings. This agrees with Kerkhof (1995) stated that in dry lands farming areas, growing trees is much more difficult due to scarcity of water. Growth rates are slower, survival rates are poorer, and protection of seedlings is more of a problem. Farmers are therefore more cautious about investing time and effort in tree growing. Some respondents (14.3%) attribute seedlings mortality to lack of monitoring and follow up of the seedlings at the farms, while 9.1% attribute seedlings mortality to the soil. Although the farmers apply fertilizer to their crops, they do not apply it to the trees. Mishandling of seedlings during planting was mentioned as a cause of damage to seedlings as mentioned by 2.6% of the respondents.

Table (5.11): Reasons of seedlings mortality at the study area

Locality	N	Watering %	Follow up %	Soil %	Insects %	Handling %	Other %
Jebel awlia	17	5.9	29.4	23.5	100	0	17.7
El bagair	40	30	7.5	5	60	2.5	27.5
Elshohada	20	40	15	5	80	5	5
Total	77	21	11	7	57	2	14
Average %	25.7	27.3	14.3	9.1	74	2.6	18.2

Some respondents mentioned other factors which they believe to be behind the mortality of seedlings, like damage during transportation and animals.

5.17. Extension services

Leagans (1961) defined extension education as an applied science consisting of content derived from research, accumulated field experiences and relevant principles drawn from the behavioral science synthesized with useful technology into a body of philosophy, principles content and method focused on the problems of out of School education for adults and youth. Chowdhry (1983) illustrates extension as an on-going process of getting useful information to people and assisting those people to acquire the necessary knowledge, skills attitudes to utilize effectively this information or technology. Generally the goal of the extension process is to enable people to use their skills, knowledge and information to improve their quality of life (Adams, 1982). In the study area the respondents revealed that there are considerable efforts made by the extension unit in the study area to sensitize and mobilize farmers to participate in the afforestation program through adoption of agro forestry intervention. Table (5.12) shows the responses of the target group regarding the role of the extension unit.

Table (5.12): Role of the extensions unit in the study area

Locality	N	Extension %	Tree harvesting %	Agricultures Methods %	Irrigation methods %	Pesticides & fertilize%	Other %
J.awlia	17	100	0	5.9	5.9	5.9	0
El bagair	40	72.5	12.5	12.5	12.5	17.5	30
Elshohada	20	80	10	10	11	5	10
Total	77	62	7	8	8	9	14
Average %	25.7	80.5	9.1	10.4	10.4	11.7	18.2

The majority of the respondents (80.5%) stated that there is an extension service introduced by the staff of the central nursery, the rest of the respondents asserted that there are no extension services. The majority of this group consists of farmers from Al bagair. Twenty per cent of the interviewed sample from Soba area declared lack of extension services at the study area. About 11.7% of the respondents asserted that they were advice to use fertilizers and pesticides during the early stage of seedlings development because the study area is known with high insect infestation. While 10.4% of the respondents stated that they have received extension on irrigation methods (type and interval of irrigation) and a similar percentage (10.4%) mentioned agricultural methods (agroforestry and application of the rotation system). Some respondents (9.1%) stated that they have received extension focusing on tree harvesting, while 18.2% mentioned other fields of extension. From the above finding it is clear that most of the extension messages are not tackling sensitive issues like changing attitudes of clients; motivate farmers to adopt different models of social forestry, and enlightenment about the role of trees. It seems that the central nursery is not functioning satisfactory. This agrees with El Mahdi and Mahony (1990) showing that the forestry extensionists spent the bulk of their time in and around their central nurseries, caring for seedlings and reception of requests for seedlings delivery instead of encouraging new comers to join the afforestation program. It worth mentioning that, extension process offers advice and information to help themselves to solve their problems (Oakley and Graforth, 1985).

5.18. Forestry extension

Extension deals with dissemination of information and transfer of technical know how from experts to clients. Different methods are deployed to attain these objectives. In the study area the work of the extension unit is not satisfactorily to guarantee success of afforestation programs and this is mainly to the limited extensionists' visits to the study area. Table (5.13) shows the visits of the extensionists in the study area.

Table (5.13): Extensionist visits to the study area

Locality	N	No Extension %	Annually %	Weekly %	Frequently %	Other %
J. awlia	17	100	0	0	0	0
El bagair	40	80	0	5.9	2.5	10
Elshohada	20	70	10	0	0	5
Total	77	63	2	1	1	5
Average %	25.7	81.8	2.6	1.3	1.3	6.5

The majority of the respondents (81.8%) stated that there is no extensionist visits to farmers (farm visits), while the rest (18.2%) showed the existence of extensionists visits. None of the respondents of Jebel Awlia asserted the existence of such visits. Farm visits is one of the individual extension methods through which the extensionist become in a close contact with farmers to explore the constrains and monitor and evaluate success. This agrees with El Mahdi and Mahony (1990) who stated that individual extension method is not an effective way of promoting the cause of the mass of small farmers. However, as the most intensive form of communication between farmers and extension workers, it plays an important role in complementing group and mass group.

Respondents were asked about the last extension visits to the study area, no one of the respondents was able to remember the time of the visit and the issues discuss during the last visits. This means the role of the staff of the central

nursery is to produce the seedlings and distributed to the farmers with no attention to monitor the planted seedlings. From the above findings it is clear that the visits of the extensionists to the study are not systematic. This is clearly shown in the above table where only 1.3% of the respondents asserted that the extensionist visits is on weekly basis, a similar percent of respondents accentuate that the visits are not frequent (sporadic). About 2.6% describe the visits as once per year, while 6.5% mentioned other types of visits which take place without program or stated agenda. These findings disagree with (El Hadi, 2005) who mentioned that the extension visits are systematic in the study area and on a regular basis.

5.19. Main fields of extension services in the study area

Extension is a term which is open to a wide variety of interpretations. Each extension agent has his own understanding of what extension is. This understanding is based on the past experience and the particular type of extension service in which the agent is working. In other words, there is no single definition of extension which is universally accepted or which is applicable to all situation extension is a dynamic concept in the sense that the interpretation of it is always changing, therefore, it is not a term which describes a continual & changing process in rural areas. Its objectives to change farmers' outlook towards their difficulties. It is not just concerned with physical and economic achievements but also with the development of the rural people themselves. Extension agents therefore discuss matters with the rural people; help them to gain a clear insight into their problems and also to decide how to overcome these problems. In the study area the extension messages despite their meagerness, they used to tackle certain issues and ignore some other important issues. Fig (5.8) shows the main fields tackled by the extension staff in the study area.

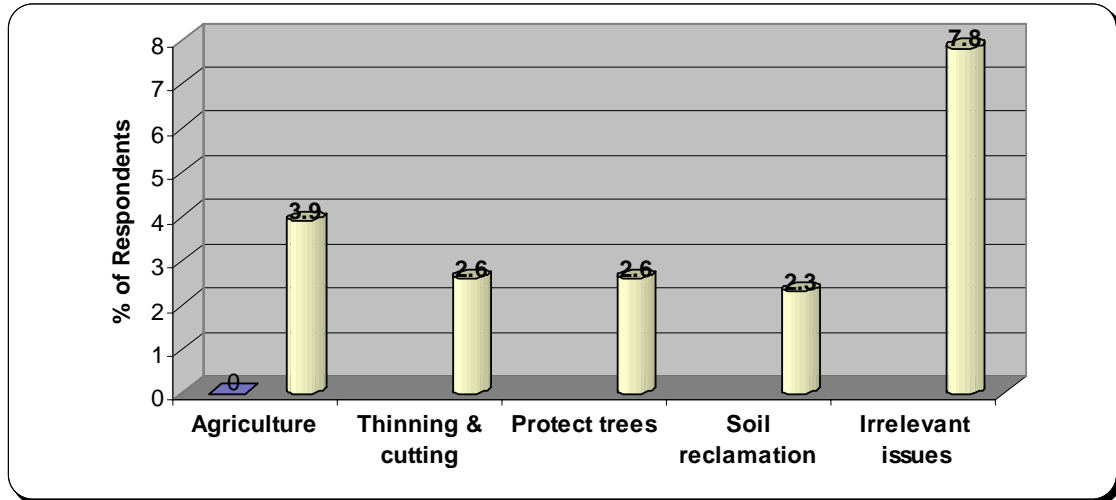


Fig (5.8) The main fields tackled by the extension staff in the study area

The majority of the respondents who mentioned existence of extension services in the study area described the extension messages they receive from the extensionists as irrelevant, while 3.9% asserted that the extensionists focus on agricultural issues on the expense of forest trees. About 2.6% of the respondents mentioned thinning and pruning of trees as issues covered by the extensionist. A similar percentage of respondents stated that extensionists focus on protection of trees, while 2.3% stated that extensionist used to repeat the information about Damas tree and its potentiality in the reclamation of salty soils.

CHAPTER VI

CONCLUSSIONS AND RECOMMENDATIONS

6.1. Conclusions

- The majority of the respondents (90.9%) possessed trees in their farms, and almost all of them relied on artificial regeneration through seedlings obtained from the central nursery.
- The bulk of the farmers (89.6%) rely on pump irrigated cultivation and this is mainly due to the closeness of the farms to the Blue Nile in the study area. While the rest of the respondents rely on the wells for irrigation. This situation grantee the success of afforestation program if a special extension message formulated to address this issue.
- About 57.1% of the respondents asserted that the FNC nurseries are the source of their seedlings, 49.4% mentioned private nurseries as sources for their seedlings.
- There is a significant difference in the management of the central nursery under the management of FINNIDA and the FNC in terms of prices of seedlings and transportation of seedlings.
- The central nursery during FINNIDA is well backed by an effective and efficient extension unit, and the extension services were perceived as the strongest cycle in the success chain. The extensionists were provided by all the necessary tools and inputs besides means of mobility. This situation differs completely under the FNC administration.
- Farmers mentioned different factors behind the high mortality of seedlings at their farms. Insect damage was mentioned by 74% of the respondents, particularly locusts and termites. While the rest of the respondents mentioned water shortage as a responsible factor for the mortality of seedlings, lack of monitoring.
- All the respondents from areas close to the FNC central nursery at Soba asserted that there are extension services introduced by the staff of the

central nursery, while respondents remote from the central nursery stated that no extension services is provided to them.

- The main issue tackled by the extensionist include; application of fertilizer and pesticides, irrigation methods (type and interval of irrigation), agricultural methods (agroforestry and application of the rotation system), and tree harvesting.
- Trees are adopted at farms for different reasons, namely; protection of top soil, provision of fuel wood, provision of fodder, and provision of building materials.
- Benefits gained from tree planting at farms, as perceived by farmers, are represented in establishment of windbreak (protection of soil and crops), additional source of income, provision of shade and increase of the aesthetical value of their farms.
- Several factors attributed to low adoption of agroforestry model in the study area among which are; small areas of some farms, competition between trees and agricultural crops, and trees harbor birds and insects.
- The main constraints and measures of risk confronting tree planting in the study area, as perceived by farmers, include; fluctuation of rainfall, frequent drought cycles, lack of protection (fencing), roaming livestock, and poor extension messages.
- The majority of the respondents (81.8%) stated that there is no extensionist visits to farmers (farm visits), while the rest (18.2%) showed the existence of extensionists visits.

6.2. Recommendations

- F.N.C. must put an annual planning for afforestation program by following up the farms, institutions and schools and to increase the awareness about the trees, so as to investigate the afforestation trend in the study area.
- For successfully afforestation programme FNC must link any extension program with an effective audio visual.

References

- Adam, M. E. 1982.** Agricultural extension in developing countries. Long man Group, London.
- Adams, Geoffrey. 2001.** Effective management in extension advisory services in Central and Eastern European countries. The technical guidance and supervision of FAO Research, Extension and Training Division. Eger, Hungary.
- Ageed, 2002.** Role of Forestry Extension in Promoting Peoples Participation in Singa Area. M.Sc. Thesis. University of Khartoum. Khartoum.
- Agrability Brochure. 1999.** Promoting Success in Agriculture for People with Disabilities and Their Families. U.S. Department of Agriculture - CSREES
- Ali, Omar A. 2000.** Sudanese States, Facts and Figures.(Arabic language).
- Badi, K. H. 1989.** The Natural Forests. In: Ahmed El Houry and Abdelaziz Mohamed Saeed Bayoumi (Ed.). The Forests of the Sudan. Khartoum.
- Barier, J. M. 1982.** Connaissance de proprietaires forestiers-les etudes de F. RHONE – ALPSE I. N. R. A. Nancy.
- Benner, M. 1982.** Les enquetes de motivations aupres des proprietaires
- Burchinal, Lee's. 1986.** Lecture Notes and Steps in Conducting a Survey. Presented at the 2* annual Forestry extension workshop on the Methodologies and Techniques in conducting Forestry extension program in Sudan.
- Burton, E. Swanson, B.E., Bentz, R.P. and Sofranko, A.J. 1997.** *Improving agricultural extension. A reference manual.* Extension, Education and Communication Service, Research, Extension and Training Division, Sustainable Development Department. FAO, Rome.
- CAMBRIDGE JOURNALS. 1998.** Cambridge University Press Cambridge University Press. Volume 27. Issue 01(March).PP121-125.
- Castillo, J. X., & Cano, J. 2004.** Factors explaining job satisfaction among faculty. Journal of Agricultural Education. 45(3), 74-75.
- Chamber, 1982.** R.1983. Rural Development: Putting the last first: IBRD, London.
- Chowdhry, k. 1983.** Forestry development: strategy and structure. A paper presented at the FAO/SIDA Consultation on Forestry Administration for Development, Rome Italy, 2-11 February, 1983.
- Contant, R.B. 1979.** "Training and Education in Agro-forestry." In T Chandler and D. Spurgeon, eds., International Co-operation in Agro-forestry. pp. 190-218. Proceedings of an International Conference, DSEIICRAF. Nairobi.
- COWI consult, 1991.** Afforestation and Reforestation in the Northern Region, Sand dune fixation, Khartoum Sudan.
- De la region Lorraine – Alsace INRA. Nancy
- DECARP, 1976.** Sudan's Desert Encroachment Control and Rehabilitation Program. Khartoum.

Department of Education and Science. 2009. Mount Temple Comprehensive School and Rosmini Community School part of pilot plan for high-speed wireless broadband - Minister Haughey. Dublin, 25 June, 2009 –

Diem, K. (1997). Measuring impact of educational programs. Rutgers Cooperative Extension Fact Sheet #869. New Brunswick, NJ

Diem, K. (1999). Choosing appropriate research methods to evaluate educational programs. Rutgers Cooperative Extension Fact Sheet #FS943. New Brunswick, NJ.

El Hadi, 2005. Social and Environment Evaluation of the NGO Projects in Sudan (Case Study Finnida Project), a thesis for PhD Degrees. U of K Khartoum Sudan.

El Khidir, Ghazi. 2003. Local people's Perception towards NGOs Interventions in Forestry Activities. Case study – White Nile State. A case Study; Dinder Locality-Sudan. A thesis submitted for the fulfillment of the degree of Master of Science in forestry. University of Khartoum.

El Mahdi, E. Satti and Des Mahony.1990. Forestry Extension in Sudan a Review of strategy. Fuel wood development for energy in Sudan. Khartoum.

Fairclough, N. 1992. Discourse and Social Change, Cambridge: Polity Press.

Falconers, J.1987 Forestry Extension: A review of the key issues social forestry net work paper No 40.

FAO, 1980. Towards a forestry strategy for development. Secretariat note committee on forestry, Fifth session, 26-30 May, 1980.W/G 9982.COFO-80/3 April, 1980.FAO, Rome.

FAO, 1989. Role of forestry combating desertification. FAO. Conservation guide 21.Rome.

FAO, 1994. Renewable and Sustainable Energy Reviews
Volume 12, Issue 7, September 2008, Pages 1864-1889.

FAO. 1984. Agricultural Extension. Manual Reference. FAO Forestry, Rome.

FAO. 1985. Guide to Extension Training. FAO.Training Series. FAO Forestry Paper (11), Rome

FAO. 1986. Forestry Extension Organization. Paper No (66), Rome

FAO. 1988. Forestry Extension Curricula. FAO Forestry Paper No (85), Rome.


FAO. 2000. Forest Resources Assessment. Rome, Italy

FAO.1987. Forestry Extension Methods. FAO Forestry Paper No (80).FAO, Rome.

FINNIDA. 1986. Rehabilitation of Khartoum greenbelt. Khartoum, Sudan

FNC. 2002. Forests National Corporation annual report. Khartoum, Sudan.

Garforth, C.J. 2003. Promotion and Dissemination. Pages 11-14 in: *The contribution of small ruminants in alleviating poverty: communicating messages from research.* Proceedings of the third DFID Livestock Production Programme link project (R7798) workshop for small ruminant keepers Izaak Walton Inn, Embu, Kenya, 4-7 February 2003.

- Gerber, Julien-François, Sandra Veuthey, Joan Martínez-Alier. 2006.** Linking political ecology with ecological economics in tree plantation conflicts in Cameroon and Ecuador. *Ecological Economics*. Volume 15, Issue 2, November 1995, Pages 149-156.
- Hardie, T. 2004.** Alternative Decision Making Processes for Consensus-blocked Decisions in the IETF draft-hardie-alt-consensus-02.txt Network Working Group. Internet-Draft Qualcomm, Inc. Category: Experimental. April
- Harrison, M.N. and Jackson, J.K. (1958).** Ecological classification of the vegetation of the Sudan – Bull. Forestry Department, Khartoum, N.S.No. (2).
- Hodgart, Alan. 2006.** Leadership & Effective Change Management. Managing partners, UK.
- Ibrahim, Akram M. 2006.** Evaluation of the environment impacts on urban forests in greater Khartoum Based in Remote Sensing and GIS Techniques. A thesis for PHD, degrees.UofK Khartoum, Sudan.
- IFAD, 2006.** International fund for agricultural development. Executive board-eighty-seventh session. Rome – Italy.
- Journal of Development Studies, 1984. Subjects:** Development - Soc Sci; Development Economics; Development Studies Volume 20, Issue 4 July pages 303 - 317 Published in:  Journal of Development Studies,
- Kellogg W.K. 2001.** Logic Model Development Guide. Retrieved January 8, 2005, W.K. Kellogg Foundation from <http://www.wkkf.org/Programming/ResourceOverview.aspx?CID=281&ID=3669>
- Kerkhof, P. 1995.** Agroforestry in Africa: A survey of project experience. SIDA/CTA, London.
- Khartoum state, 2000.** Annual Report, 2000Ministry of Agriculture, Animal wealth and Irrigation. Khartoum State. Khartoum, Sudan.
- Leagans J.P. 1961.** Extension and Education in Community Development; Directorate of Extension Govt. of India.
- Lofland, J, and Lofland, L.H. 1995.** Analyzing Social Settings: A Guide to Qualitative Observation and Analysis, 3rd Ed. Belmont, CA: Wadsworth.
- Oakley, P. and Garforth, C. 1985.** Guide to extension training. *Agriculture* Extension and Rural Development Centre, School of Education, University of Reading, UK, and Food and Agriculture Organization of the United Nations, Rome.
- Oates, Sarah; D. Owen, and R. K. Gibson (Eds.), 2006.** The Internet and Politics: Citizens, Voters and Activists. Madison, N.Y.: Routledge,. 240 pp., 615-616ISBN
- Noe, Roger. 2007.** A Passion for Leadership *Sunday, June 28, 2009.*
- Pennsylvania Farm Bureau. 2006.** The Pennsylvania Department of Agriculture and the United States Department of Agriculture, USA..
- Richards, J. (1990).** *Program Design*. Workshop delivered at the University of Queensland. St. Lucia, June 20

Rocheleau, D. 1985. Women, trees and tenure: implications for agroforestry research and development. Unpublished paper for International Workshop on Tenure Issues in Agroforestry. Nairobi.

Role of forestry in combating desertification. FAO conservation guide 21. Rome

Schooler, C., Chaffee, S. H., Flora, J. A., & Roser, C. 1998. Health campaign channels: Tradeoffs among reach, specificity, and impact. *Human Communication Research*, 24, 410–432.

Sen, D. and P. K. Das. 1987. The management of people's participation in community forestry. Some issues. Social Forestry Network. Paper 4D.

Song, Y. and R. Vernooy. 2003. Participatory Maize and Livelihood Improvement in Southwest China. *Agricultural Research and Extension Network Newsletter*, 48 (July): 8.

U.S. Department of Health and Human Services. 2000. Healthy people 2010 (2nd ed.; in two volumes: *Understanding and improving health and Objectives for improving health*). Washington, DC: U.S. Government Printing Office.

UNEP, 2006. Environment for development. News from the campaign. Billion tree campaign in turkey.

Van worldwijk, 1984. Ecology Textbook of the Sudan, K.U.P. Khartoum, Sudan,

Wallach, L., & Dorfman, L. 1996. Media advocacy: A strategy for advancing policy and promoting health. *Health Education Quarterly*, 23(3), 293–317.

Wilkens, G. C. 1978. Integrating forest and small scale farm systems in Middle America. *Forest ecol. And manage.* 1 (1).

Wilson, H. C. 2000. Emergency response preparedness: small group training. Part 2 – training methods compared with learning styles. *Journal of Disaster Prevention and Management.* Volume 9. Issue 3. pp 180-199. Publisher, MCB UP Ltd.

Appendix

Questionnaire For the local people in the study area

This questionnaire was made to collect information about the assessment about forestry activities at Khartoum Forests State in duration (1997-2007). The information will be utilized in a research for M.Sc. degree.

Please answer the following questions as accurately as possible. Where actual data are not available please use your closest estimation. Your answers will be strictly confidential. In the questions where you are asked to tick one or more of the cases, indicate this in the space provided.

Locality

Unity

General characteristics:

1- Gender:

*Male ()

*Female ()

2- Education level:

* Illiterate ()

* Khalwa ()

*Primary ()

* Secondary ()

* University ()

*Post graduate ()

Source of income

* Animals rearing ()

* Farmer ()

* Private post ()

* Government post ()

* others (specify)...

3- Sources of income:

*Animals rearing ()

*Farmer ()

*Private sector ()

*Government ()

*Others ()

4- If the source of income is agriculture

Land tenure	Total area	Area covers with trees		Crops area	No trees
		Natural	Plantation		
Owner ship					
Hicker					
Rent					
Participation					
Others					

5- Source of irrigation:

* Rain fed ()

*Irrigated ()

6- What kind of trees in your farm?**7- What is the source of seedling?**

* Forests ()

*Private nurseries ()

*Personnel selection ()

8- What is the seedlings transportation?

* Vehicles ()

*Rent cars ()

*Forests cars ()

*Private cars ()

9- How did you know seedlings in Soba?

(a).....

(b)

(c).....

(d).....

10- Did you obtain all seedlings you need?

*Yes ()

*No ()

11- If the answer is yes, in which year?**12- How many seedlings did you obtain?****13- How many seedlings were damages?****14- What were the reasons of the damages?****15- What were the seedlings cost?****16- Is the extensionist supervising the agriculture?**

*Yes ()

*No ()

17- If the answer yes, what are their supervision?**18- How did you select the kind of trees?**

*My desire ()

*an extension mission ()

19- What were the purposes of keeping the trees in the farm, if it is natural Or plantation?

*Protection purposes ()

* fuel wood Production ()

*Building ()

*Fodder ()

*Others (specify) ()

20- Did you evaluate the cost of planting trees in the farm?

*Yes ()

*No ()

21- If the answer yes, explain?

- *The seeds () *the irrigation () * the protection ()
- *Land preparation () *other costs ()

22- If there are no trees in farm, what are the reasons?

- *Nail of the seeds () *Few of land ()
- * The growth not encouraged () *Reduce the crops ()
- * Not economical ()

23- What are the useful trees in your opinion?

24- What are the benefits of peoples planting trees?

25- By which process the trees were planted?

- *Windbreaks () *Plantation fence ()
- *In lines () *Random ()
- * Change the farm to a forest ()

26- Did you have wind breaks in your farm?

- * Yes () *No ()

27- If the answer is yes, explain?

28- Did you agree planting trees with crops?

- *Yes () *No ()

29- If the answer is yes, explain the reasons?

30- If the answer is no, explain the reasons?

31- Which thing that threaten the agriculture in your area?

- *Few of rain fed () *Over grazing ()
- *No protection () *others (specify) ()

32- Which factors encourage the agriculture?

- *Awareness of local people
- *Substitutes of an energy
- *Planting community forestry

33- What are the dominant trees in your area?

- (a)
- (b)
- (c)
- (d)

34- What are the forestry activities exist in your area?

35- Is there any forestry extensionist in your area?

- *Yes () *No ()

36- If the answer is yes, how many extension visit since planting trees?

37- If there any regular visit of the extension?

- *Yes () *No ()

38-If the answer is yes, is there any information you know?

39- What is the last extensionist visit?

40- Which is level of the people willing to own private forests?

- *Weak () *Good ()

41- What are the problems limited to own the private forest?

*Few of land ()

*Aware less of forestry benefits ()

*Fair of failure ()

42- Did you have any training in forestry activities?

*Yes ()

*No ()